EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fabrication Shop Support

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Model, Machine, and Fabrication Shop Support
Continuation of WA 2-01
The contractor shall not begin work until 4/1/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Richard Valentine (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4437 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/14/12 (Date)	Branch/Mail Code: C POD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Statement of Work
For EP-C-09-027 WA 3-01
Model, Machine, and Fabrication Shop Support

Purpose : This Work Assignment shall provide shop support for research and development projects at EPA/RTP/NRMRL/APPCD.

Statement of work : The Contractor shall provide technical and trade support for pilot scale, bench scale, and process measurement instrumentation including design, fabrication, modification and repair of research and development equipment and facilities. Examples of support include preparation of custom designs and layouts for innovative sampling apparatus and instrumentation, and installation or repair of pollution control equipment such as combustors, baghouses, diesel engines, refrigeration equipment, dynamometers, wind tunnels, and HVAC or building utility systems.

The Contractor shall provide machinists, fabricators, and other trade personnel skilled in the fabrication of research equipment from raw materials such as stainless steel, aluminum, Plexiglas, Teflon, sheet metal, PVC, wood, or rubber. The Contractor shall outfit or modify research vehicles as directed by the WAM.

The Contractor shall operate specialized equipment in the NRMRL/APPCD Machine and Fabrication Shop. Typical skills include machining, welding, cutting, plumbing, carpentry, and assembly of technical apparatus into working systems. The Contractor shall provide machinists skilled in the use of engine lathes, milling machines, Computer Numeric Controlled (CNC) machines, saws, drill presses, and other standard machine shop equipment. The Contractor shall provide licensed electricians for power wiring of equipment and circuitry.

The Contractor shall maintain Government-furnished equipment in proper working condition. Repairs and maintenance of such equipment shall be coordinated with the WAM.

The Contractor shall provide the WAM with weekly electronic time accounting which shall include the Branch/organization for whom the work was performed.

The Contractor shall adhere to all EPA and local Health and Safety regulations, observe good working practice, and operate in accordance with EPA/RTP's Environmental Management System (EMS) policies and the RTP Chemical Hygiene Plan.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Model Machine and Fabrication

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$649,994.00	
Total:	$649,994.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee: $649,994.00	LOE: 8,998
Cumulative Approved:	Cost/Fee: $649,994.00	LOE: 8,998

Work Assignment Manager Name: Richard Valentine (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4437 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus 5/10/12 (Signature) (Date)	Branch/Mail Code: CPAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-02

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	GHG and HAP Measurements Metho

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/23/2012 To 03/31/2013

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2):

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Jeff Ryan (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-1437 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 4/23/12 (Date)	Branch/Mail Code: C.POD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Statement of Work
for
GHG and HAP Measurements Methods Development Support to Program Offices

Project Description:

With the implementation of ORD's Path Forward initiative, the Air, Climate, Energy (ACE) research component includes targeted research specifically to support the Program Office's and their emissions measurement methods development needs. This WA is intended to support several research "tasks" (ACE Tasks 222, 096, and 224) identified in the ACE Research Action Plan. Moreover, this WA is intended to implement research that encompasses multiple OAR emissions measurement methods development topics and needs.

These include:

- Performance of hydrochloric acid (HCl) continuous emission monitors (CEMs) to support regulatory compliance applications
- Performance of HCl Reference Methods as they pertain to HCl monitoring certifications
- Performance of nitrous oxide (N20) CEMs to support Greenhouse Gas (GHG) monitoring
- Performance of carbon monoxide (CO) CEMs at low concentrations
- Evaluation of Fourier Transform Infrared (FTIR) for the measurement/monitoring of organic Hazardous Air Pollutants (HAPs)
- Evaluation of innovative measurement/monitoring approaches and technologies
- Evaluation of mercury (Hg) speciated measurement quality approaches and technologies

The purpose of this WA is to conduct research that targets the regulatory research needs identified above. This research support is expected to require both laboratory and field testing in order to fully understand the quality of the measurement technologies under investigation.

Project Objectives:

The primary objective of this project, and therefore the primary level of effort in the WA, is to demonstrate the readiness and quantitative measurement performance of commercially available, HCl and N2O gas analyzers or CEMs for point source monitoring and compliance measurement application. For HCl CEMs, the primary focus is the quality of low level (~ 2 ppm) measurements associated with emissions from coal-fired power plants and cement and lime kilns. A desired outcome of this work is to generate data that will support the formal development of HCl monitoring procedures. Another major objective of this project, is to assess the suitability of existing monitoring (i.e., PS-2, Part 75) and instrumental Reference Method (i.e., Method 7E, Method 320, ASTM D 6348-03) approaches that can be used to establish formal EPA, N2O-specific monitoring specifications and procedures and Reference Methods that can be used to support GHG regulatory actions.

Another major objective of this WA is to determine the potential suitability of FTIR as well as other innovative monitoring technologies, as a regulatory compliance monitoring tool for organic HAPs.

Formaldehyde, benzene and acrolein are of primary interest. Technology sensitivity (detection limits), proper wavelengths for quantitation, spectral interferences, status and availability of calibration standards are examples of associated considerations. It is anticipated that this work shall require a combination of theoretical and empirical information gathering including some pilot-plant testing on the MPCRF.

In addition, another objective of this WA is to examine the quality of speciated Hg measurements for emissions characterization purposes. Such measurements are particularly important, yet increasingly complicated, in high particulate matter (PM) environments (e.g., upstream of pollution control devices/systems). Several Hg speciating methods are currently available (e.g., Ontario-Hydro and Method 30B with KCl traps), however their measurement performance is relatively unknown. An independent techniques such as the Flue-gas Unfiltered Mercury Emissions (FUME) method, can be used to verify measurement quality. This WA will be used to perform pilot-plant testing to evaluate approaches for assessing the quality of speciated Hg measurements.

This WA is a continuation of WAs 2-08 and 2-02.

Statement of Work:

TASK 1. Work Plan, Reporting, Budget, And WA Management

The contractor shall prepare and deliver to the WA manager (WAM) a work plan and budget within 20 days of WA effective date. The work plan must include a description of how the contractor shall accomplish each task, along with a breakdown of level of effort by professional level per task; a cost breakdown per task, and any underlying assumptions used. The contractor shall conduct activities necessary to manage the WA, including at least weekly communication with the EPA WAM.

TASK 2. Preparation of New WA QAPP

The contractor shall prepare and deliver a new WA QAPP. The QAPP shall be developed according to the requirements in Appendix #1 to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

TASK 3. Survey of Available GHG and HAP Monitoring Technologies

The contractor shall conduct a market survey of commercially available GHGs and HAPs emissions monitoring technologies and the individual pollutants they are capable of measuring and associated measurement technology information Pollutants of interest include, but are not limited to: HCl, N2O,

CO, volatile and nonvolatile organics (particularly those that may be indicators of combustion performance such as formaldehyde, benzene, PAHs, etc). This survey shall identify, but is not limited to, characteristics such as measurement/detection principle, available measurement ranges, stated manufacturer measurement performance capabilities (e.g., selectivity, sensitivity, linearity, precision, etc), spectral interferences (including principal wavelength regions of target analytes). The survey shall also attempt to identify applications where these units are used, including associated installation specifics and QA/QC activities. Topics to be considered shall also include, but are not limited to: sample delivery/conditioning approaches, calibration technique(s), example installations, etc. The contractor shall provide the WAM a template of the information topics to be acquired, including target pollutants prior to fully performing the survey. (Target Completion – 6/30/12)

TASK 4. Pilot-Plant Testing of HCl CEMs

The contractor shall conduct testing on EPA's Multi-Pollutant Combustion Research Facility (MPCRF) to evaluate the quantitative measurement performance of HCl CEMs under actual and varied combustion conditions. Tests shall consider natural gas and coal combustion conditions as a minimum. Quantitative performance of the HCl CEMs shall include use of EPA Reference Methods (including use of FTIR) as comparative references. Emphasis shall include the lowest concentrations that can be measured reliably. Concentrations in the 0.5 to 2 ppm range are of primary interest. The candidate HCl CEMs technologies shall be as representative as possible of those commercially available. The contractor will be responsible for obtaining the HCl CEMs to be tested. The purchase or leasing of HCl CEMs shall be considered. At least 4 different HCl CEMs are desired to be tested. (Target Completion – 9/30/12)

TASK 5. Pilot-Plant Testing of N20 CEMs

The contractor shall conduct laboratory and pilot-scale combustor testing to characterize the measurement performance of candidate N20 analyzers. These characterizations shall focus on spectral interference test approaches such as that found in 40 CFR Part 60 Method 7E. Testing shall be conducted with simulated and actual emission environments (e.g., fossil fuel combustion). Emphasis shall also include the lowest concentrations that can be measured reliably as well as concentrations anticipated at Adipic and Nitric Acid plants. The contractor shall also determine the feasibility of including an FTIR as part of these tests. (Target Completion – 10/1/12)

TASK 6. Combustion Testing of VOC Measurement/Monitoring Technologies

The contractor shall conduct laboratory and pilot-scale combustor testing to characterize the measurement performance of candidate VOC measurement/monitoring technologies including, as a minimum, FTIR and Jet-REMPI technologies. The ultimate intent is to gain an indication of the lowest concentrations that can be potentially measured. The combustion environment and associated

complexities shall be considered in addition to fundamental aspects such as FTIR system path length, appropriate quantitation wavelength(s) and spectral/data resolution. Quantitative measurement performance shall include evaluation by dynamic spiking. Emphasis is to be placed on the HAPs considered to be target analytes from combustion sources (e.g., formaldehyde, acrolein, benzene and benzene-like, and the halogenated species). (Target Completion - 12/1/12)

TASK 7. HCl CEM Field Testing

The contractor shall perform field testing with the purpose of demonstrating the performance of HCl CEM technologies for monitoring applications as well as the individual components of the HCl CEM Performance Specification (i.e., dynamic spiking, stratification testing, etc.) The basis for testing will follow the most current version of the HCl Performance Specification available. This will include the RATA testing component, using FTIR (following 40 CFR Part 60 Reference Method 320) and impingers (following 40 CFR Part 60 Reference Method 26A) as the reference methods. At least 2 field tests are to be considered at test sites to be confirmed by the WAM. These sites are likely to be a coal-fired power plant and a cement plant located in the Midwest or Southeast. (Target Completion – 3/31/13)

TASK 8. N20 CEM Field Testing

The contractor shall perform field testing with the purpose of demonstrating the performance of candidate N2O monitors as well as FTIR as the reference method (following 40 CFR Part 60 Reference Method 320). At least 2 field tests are to be considered at test sites to be confirmed by the WAM. These sites are likely to be Adipic Acid or Nitric Acid plants located in the Midwest or Southeast. (Target Completion – 3/31/13)

TASK 9. Draft Performance Specification and Reference Method Measurement Methods

The contractor shall prepare draft versions of theoretical N2O monitoring and reference method procedures. The contractor shall use 40 CFR Part 60 Performance Specification 2 and Reference Method 7E as templates. The EPA WAM will provide the electronic versions of these methods to the contractor. The EPA WAM will be responsible for finalizing these documents. (Target Completion – 2/1/13)

TASK 10. Experiments to Resolve the Elemental vs. Oxidized Hg Discrepancy

The contractor shall conduct experiments to further characterize the fundamental differences between NIST traceable solution HgCl2 generators and Hg0 generators. Ideally, these experiments will indicate which gas standard is accurate and which is not. Should this be the case, the contractor shall propose experiments to determine the reason for the discrepancy. (Target Completion – 3/1/13)

TASK 11. Speciated Measurement Quality Testing

The contractor shall develop and evaluate approaches suitable for assessing the speciated Hg measurement quality of APTB's Hg CEMs associated with pilot-plant testing operations. Approaches shall include as a minimum probe floods and dynamic spiking with elemental and oxidized hg gas standards as well as independent, reliable elemental Hg measurements such as FUME. (Target 10/31/12)

TASK 12. Speciating Sorbent Trap Testing

The contractor shall conduct laboratory testing to evaluate speciating sorbent traps. Specific focus shall be placed on the level of performance achieved while conducting the Field Recovery Test component of the RM. Field Recovery Tests shall be conducted in replicate under varied conditions with multiple sorbent trap materials and shall be limited to analysis by the Thermal Analysis (Lumex) technique. (Target 10/31/12)

Several sub-tasks have been identified:

1. The contractor shall perform laboratory tests to determine the acceptable upper temperature range that speciated traps can be used. These tests shall include approaches to mitigate temperature effects, including air-cooled probes
2. The contractor shall perform proof of concept testing on APPCD pilot-plant combustors demonstrating the performance of the air-cooled probes.
3. The contractor shall perform pilot-plant testing using quad probes, preferably in a high temperature environment, to demonstrate the speciated measurement quality
4. The contractor shall perform speciated measurement tests concurrent with Ontario-Hydro samples and speciating Hg CEMs, including application of the FUME method.

TASK 13. Support Emissions Characterization Equipment and Protocols Familiarization and Technical Training Activities

The contractor shall prepare training materials that will be used to train and familiarize potential users of Method 30B, including sampling and Thermal Analysis. These training materials will be used to facilitate hands on Method 30B equipment training. The contractor shall also conduct the hands on training as identified by the WAM in writing. Travel to China to perform this training, is likely. For the purposes of this WA, a single trip to China to perform this training should be anticipated. Deliverable date will be determined through written technical direction by WAM.

TASK 14. Equipment Purchases/Rentals

To perform this WA, it will be necessary for the contractor to procure, either by purchase or lease, equipment to carry out the Tasks described above. Specifically, the items listed below are likely to need to be procured:

- HCl and N2O CEMs
- Compressed gas standards and associated regulators
- Gas Blenders
- Heated sample lines
- High temperature Hg converter/detector

TASK 15. Draft and Final Reports

Several data reports are required as a function of this WA. Known reports include, but are not limited to: Draft Data - Test data summaries for each location, brief summaries of associated testing activities and procedures, copies of all ancillary data forms and log sheets (with 60 days of completion of testing); Final Data Report – All raw and summarized measurements data, QA/QC report of data quality and data limitations, if any.
Specifically, data from all tests will be reported in electronic files. They will be assembled in individual Excel notebooks that are unique for each test. Each Excel notebook will consist of:

- Summary page to summarize relevant information from the test
- Narrative page that will give a description of the test, analytical method, deviations from operating procedures during the analysis, deviations from specifications in the test plan or QAPP, problems encountered during the test or analysis, questions or issues concerning individual data points, special actions taken to verify data, data that should be further evaluated by the reviewer, and questions and issues to be addressed in preparation of the final data summary and report
- Data pages which contain all of the raw data as compiled by the individual instruments for field samples, lab samples, and QC samples
- QA/QC pages in which all pertinent QA/QC data are presented

(Target Completion – to be determined through written technical direction by WAM).

QA/QC Requirements

A new QAPP will be required for this WA. The QAPP shall be developed according to the requirements in Attachment #1 to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

Reports of Work:

The contractor shall prepare a work plan and budget as described in Task 1 within 20 days of WA effective date. The contractor shall prepare and submit monthly reports in accordance with the terms and conditions of the contract.

Health and Safety Protocols shall be prepared and submitted for approval as required by contractor, APPCD, and SHEM safety personnel.

The contractor shall maintain at least weekly communications with the WAM. Additionally the contractor shall inform the PO and the WAM in writing when 75% of the total funds and/or hours contained in the work plan are expended.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT & METHOD DEVELOPMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X Category III or IV QAPP: prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X QAPP Requirements for Measurement Projects

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

X QAPP Requirements for Method Development Projects

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of

samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.

3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.

3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.

4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.

4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.

4.5 Describe the method for uniquely numbering each sample.

4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Provide a description of the situation that requires the generation of a new or modified method.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.
3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.
3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).
4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.
4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:
- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis
- describe procedures for packing and shipping samples, and provisions for maintaining chain-of-custody, as applicable

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). If a method/SOP will be developed, specify the required format.

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-02

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	GHG and HAP Measurements Metho

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/23/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee: $0.00	LOE:
This Action:	$444,816.00	
Total:	$444,816.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 05/25/2012	Cost/Fee: $444,816.00	LOE: 4,901
Cumulative Approved:	Cost/Fee: $444,816.00	LOE: 4,901

Work Assignment Manager Name: Jeff Ryan (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-1437 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	6/28/12 (Date)	Branch/Mail Code: CPAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013	Impact of Green Building
	Base Option Period Number 3	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Impact of Green Building Products and Risk Management Solutions on Indoor Air Quality.
Costs shall not be incurred on this WA prior to 04-01-2012.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Ken Krebs (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2850	
	FAX Number:	
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2708	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/29/12 (Date)	Branch/Mail Code: CPAD	
	Phone Number: 513-487-2094	
	FAX Number: 513-487-2109	

Version 1.0
03/16/11

FY11 Scope of Work

WA 3-06

WA Title: Impact of Green Building Products and Risk Management Solutions on Indoor Air Quality

1. Purpose

The overall objective of this project is to develop, demonstrate, and evaluate sustainable practices for indoor environments. Sustainable practices are decisions and actions that consider, minimize, and harmonize the impact of materials and energy use on human health and the environment. Through integrated multidisciplinary and focused research, Indoor Environments Management Branch (IEMB) develops knowledge and tools that enable evaluation of sustainable practices for indoor environments. IEMB develops tools to characterize sources of indoor contaminants and investigates the relationships between sources of contaminants, the built environment and potential exposure to individual compounds and complex mixtures while considering the impacts of risk management solutions on building energy use. For example, IEMB investigates the impact of green building products on indoor air quality and develops risk management solutions where green building practices or products may potentially improve or impair indoor quality. Specific tasks are itemized in the section titled "Task Descriptions."

2. Background

Rapidly increasing energy costs coupled with increasing market acceptance of "green" or sustainable residential building design has resulted in an increased demand for sustainable building practices and "green" building products. However, sustainable "green" building practices (e.g., super insulated, tight buildings constructed with recycled or "natural" products) may inadvertently result in degraded indoor environmental quality or other downstream environmental challenges. As a component of "cradle to cradle" stewardship of materials and energy, there is a need to understand the impacts on the indoor environment of: (1) emissions, sorption and re-emission of organic and inorganic compounds from "green" building materials; (2) transport within the built environment; and (3) efficacy of control technologies such as air and surface cleaning, and their affect on building energy use.

Key pollutants of concern include endocrine disrupting compounds such as brominated flame retardants, phthalates, and perfluorinated compounds associated with consumer products, neurotoxins such as elemental mercury released from the debris field of broken compact fluorescent light bulbs, and air toxics such as formaldehyde released and sorbed by some indoor materials and surfaces. Formaldehyde is one key toxic pollutant in the National Risk Management Research Laboratory (NRMRL) Indoor Air Strategic Plan. It is among the US Environmental Protection Agency (EPA) listed urban air hazardous air pollutants (HAPs) and one of the predominant VOCs emitted from building products.

Primary emissions from materials and products as well as sorption and re-emission from surfaces are key factors that govern indoor concentrations.

There are three components of IEMB's research approach: (1) Develop source models that simulate emissions from green building products; (2) develop sorption/re-emission models for green building products; and (3) determine the reliability of source/sink models in full-scale indoor environments. The source emissions model parameters obtained from EPA's chamber tests will be applied to IAQ models to determine the impact of the use of "green" building design products on indoor concentrations of organic and inorganic contaminants. Source and sink models and control strategies will be evaluated by studies conducted in APPCD's Research Test House (RTH), operated by the contractor. Specific tasks and the schedule for tasks to be conducted in the RTH shall be described in amendments to this work assignment or described in other task-specific work assignments.

3. Task Descriptions

The contractor shall conduct the following tasks:

The contractor shall maintain the research test house in ready mode for model evaluation or other studies as described in amendments to this work assignment or described in separate work assignments that utilize the research test house. Specifically, the contractor shall ensure that:

All miscellaneous and standard operating procedures (MOPs and SOPs) are accurate and up to date for contractor operated measurement or control systems. At a minimum, the contractor shall ensure that:

- The data acquisition system is functional
- At least two temperature sensors and two RH sensors are functional
- The B&K Multi-gas Analyzer is calibrated for SF6
- The SF6 dosing and sampling system is functional

Per Contract number EP-C-09-027, the contractor shall maintain the instrumentation in the RTH to ensure that the RTH can be utilized for specific research tasks within 30 days of notification through written amendments to this or other work assignments.

4. Reports

The contractor shall provide the EPA work assignment manager monthly progress reports as specified in the contract.

5. Schedule of Tasks, Reports, and Deliverables

The contractor shall provide monthly reports of the RTH operational status. Reports and deliverables for other tasks, including new or revised MOPs or SOPs that are required to support QAPPs developed for specific research tasks to be conducted at the RTH, will be described in amendments to this work assignment.

6. QA/QC

The contractor shall provide input to QA test plans, addendums, technical reports, and manuscripts developed by EPA staff for and from specific experiments to be conducted in the research test house. Data gathering/manipulation shall not begin until the QAPP has been approved by the EPA QA manager. The QA plan shall be developed according to the requirements in Attachment #1 to the Statement of Work. Environmental data collection cannot start until both APPCD and ARCADIS QA staff have received the completed signature page for the QAPP. Specific experiments, schedules and deliverables will be described in amendments to this work assignment.

All draft or revised QAPPs to be implemented by ARCADIS that are submitted for APPCD QA approval must be accompanied by a signature page that is signed by the ARCADIS work assignment leader and ARCADIS QA officer to show that they have reviewed and approved the QAPP. Upon final approval of the QAPP, the APPCD work assignment manager and QA manager shall add their signatures to the signature page to show their review and approval.

7. Suggested Skills

This project will require contractor staff with the following skills: modification and adaptation of scientific apparatus to meet project objectives, sample collection and extraction, data processing and analysis, preparation, operation and maintenance of the RTH.

8. Special Requirements

The contractor shall provide necessary health and safety procedures, documentation, and training to contractor staff to ensure safe conduct of the experiments at contractor controlled facilities.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT & METHOD DEVELOPMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

X **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Provide a description of the situation that requires the generation of a new or modified method.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.
3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.
3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).
4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.
4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:
- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis
- describe procedures for packing and shipping samples, and provisions for maintaining chain-of-custody, as applicable

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). If a method/SOP will be developed, specify the required format.

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Impact of Green Building

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$34,291.00	
Total:	$34,291.00	

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 04/20/2012	$34,291.00	141
Cumulative Approved:	$34,291.00	141

Work Assignment Manager Name: Ken Krebs (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2850 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus 5/30/12 (Signature) (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-07

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Characterization of Potential

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Characterization of Potential Cross-Media Transfers from Coal Ash and Landfills

The contractor shall not begin work until 4/1/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date usa EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
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5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Susan Thorneloe (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2709 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) (Date)	Branch/Mail Code: CPAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

STATEMENT OF WORK
WA 3-07

I. **TITLE**: ***Characterization of Potential Cross-Media Transfers from Coal Ash and Landfills***

II. **Background and Purpose**:

This work assignment will build on previous research to improve the understanding of cross media transfers related to coal ash and landfills. In June 2010, a proposal for the management of coal combustion residues (CCRs) was proposed. The EPA has received over 450,000 comments. The data from their research is the principal information used in supporting updated risk assessment and responding to comments on the potential environmental release associated for disposal and beneficial use of coal ash. In addition, the Leaching Environmental Assessment Framework (LEAF) is being adopted into SW-846. The work being performed through this work assignment will provide the background information needed for LEAF to be adopted as EPA test methods.

There are five components of this work:

- The first component is to develop a report that illustrates how LEAF test methods are used to develop source term data for use in transport and fate models. This work was part of the last WA but additional hours were needed elsewhere so this task got deferred to 2012.

- The second component is completion of an interlaboratory validation of the Leaching Environmental Assessment Framework (LEAF) test methods. The first of two reports on the results of the interlaboratory validation is being put into external peer review after clearing internal peer review in addition to QA and administrative reviews. The second report is being prepared and will be going through the same review process as the first interlaboratory report.

- The third component is to complete work on the LEAF data templates and software (i.e., LeachXS-Lite) for data recording, analysis, visualization, and reporting. The software is a decision support tool that was built using an existing tool (LeachXS). LeachXS is a tool for geochemical speciation modeling and statistical analysis. LeachXS-Lite is available at no cost and provides an electronic version of the APPCD LEAF data characterizing metals leaching from CCRs resulting from air pollution control at coal-fired power plants. LeachXS-Lite provides the tools needed for use of leaching data in environmental decision making for risk and environmental assessments.

- The fourth is to complete work on compilation of data to compare field versus LEAF leachate data. This research was recommended by EPA's Science Advisory Board (SAB) and much be completed prior to meeting with SAB in 2013.

- The fifth is to conduct testing using the LEAF methods for a request from Region 2.

The data to be used for the probabilistic assessment (component 1) are from reports completed from earlier work assignments in support of the EPA Mercury Roadmap and Clean Air Act regulations for coal-fired power plants.

Provided below is a list of tasks for FY2012 for the research to be conducted through this work assignment.

III. Scope of Work

1. ***Development/Modification/Compliance with QAPP***: The contractor shall develop quality assurance documentation as required in Appendix #1 to this Statement of Work. Any work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on the "Quality Assurance Review Form" included with this extramural activity.

   There is an existing QAPP for this research (Q-TRAK # 03069-A00244) which may be updated as necessary to conduct this work. The QAPP was approved on November 17, 2011. Updates as needed will be conducted.

2. ***Report to illustrate how LEAF test methods are used to calculate source terms for use in fate and transport models.*** *The Contractor shall:*

   (a) Define scenarios to be modeled with the WA-COR to obtaining input from program office;

   (b) Fill any data gaps for mass transfer coefficients;

   (c) Repeat testing of leaching as function of pH and liquid-solid testing where there are unresolved questions about the influence of air pollution control technology on COPCs leaching; and

   (d) Document how leach results are used to improve future environmental management decisions on the use of coal ash in un-encapsulated applications including sample calculations and examples to help the reader understand how this information is used in environmental decision making.

   (e) Develop an EPA report using formatting requirements for this contract providing sample calculations and other information helpful to potential users of the LEAF test methods.

3. ***Completing interlaboratory validation of the four LEAF test methods.*** The Contractor has completed the first report on the two batch methods which will be undergoing external peer review. The Contractor shall make changes to this report using comments

provided by the WA COR. The Contractor shall develop a second report of the interlaboratory validation of the two mass transfer methods once all data are available from the labs participating in the interlaboratory validation. This report will also go through the same series of reviews and the Contractor shall make revisions based on comments provided for the WA-COR.

4. ***Comparison of field and LEAF leachate data.*** This will include making observations of the characteristic behaviors of materials using a range of management practices. The Contractor shall update the outline for this report. Where comparisons are not straight forward, the Contractor shall use geochemical speciation modeling to understand and communicate differences in leaching behavior.

5. ***Launch of Leach-XS Lite.*** The Contractor shall make revisions to Leach-XS Lite including documentation to support its release in response to comments provided from the WA-COR resulting from the peer, QA, and administrative reviews. This also includes improvements to the user interface to make implementation of the LEAF methods easier for state and local government.

6. ***Conduct testing of samples provided by Region 2 using LEAF test method 1313. The results will be provided to Region 2 by memorandum.***

7. ***The Contractor shall complete revisions to a report on the use of fly ash for cementitious materials based on comments provided by the WA-COR.***

8. The Contractor shall prepare briefing materials as needed for preparation for an SAB meeting to be scheduled in early 2013.

IV. Schedule of Deliverables

Task 1 - Status of any updates to QAPPs within one month of WA approval

Task 2 – Develop draft report by Dec 2012
Revised version by May 1, 2013

Task 3 – Revision of report for 1313 & 1316 from 30 days that comment are provided
Draft of report for 1314 and 1315 by June 1, 2012

Task 4 - Draft report to be completed by Aug 15, 2012

Task 5 - Version 1 of LeachXS Lite by Aug 2012

Task 6 - Complete processing of samples within 6 weeks of receipt of samples
Provide memo documenting results within 3 weeks from receipt of analytical results

Task 7 - Revised report within 30 days from receipt of comments from the WA-COR

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-07

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Characterization of Potential

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee: $0.00	LOE:
This Action:	$423,213.00	
Total:	$423,213.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee: $423,213.00	LOE: 5,843
Cumulative Approved:	Cost/Fee: $423,213.00	LOE: 5,843

Work Assignment Manager Name: Susan Thorneloe (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2709 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/17/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Evaluation of Expedient Decon

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
The purpose of this amendment is to repeat failed tests 1, 6, 8, 9, and 14

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Worth Calfee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 9/11/12 (Date)		Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

STATEMENT OF WORK

Amendment #1

EVALUATION OF EXPEDIENT DECONTAMINATION OPTIONS WITH ACTIVATED PEROXIDE-BASED LIQUID SPORICIDES

PROJECT# **C.2.3.1.08**

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TITLE
Evaluation of Expedient Decontamination Options with Activated Peroxide-based Liquid Sporicides.

I. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be April 1, 2012 through November 30, 2012.

II. SUMMARY OF OBJECTIVES

This work shall estimate the occurrence and potential reduction of viable bacterial spores (i.e., effectiveness) as a function of the remediation activities applied to various surfaces. The work will be completed as 3 tasks. The objective of this project is to conduct laboratory-scale efficacy tests to determine the sporicidal potential of specific test solutions under specific test conditions. Operational parameters such as processing time, physical impacts on materials or decontamination crew, and fate of the viable spores (e.g., contamination of equipment, wash water, and generation of bioaerosols) shall be determined.

III. RELEVANCE

This project supports the mission of the Decontamination and Consequence Management Division (DCMD) within the U.S. Environmental Protection Agency's (U.S. EPA) National Homeland Security Research Center (NHSRC) by providing relevant information pertinent to the decontamination of contaminated areas resulting from an act of terrorism. The project supports the NHSRC's strategic goals as described in detail in the Homeland Security Research Multi-year Strategic Plan (draft, November 26, 2008). Specifically, the project is relevant to Long-Term Goal 2 (LTG-2) which states, "The Office of Solid Waste and Emergency Response (OSWER) and other clients use homeland security research program products and expertise to improve the capability to respond to terrorist attacks affecting buildings and the outdoor environments." This project addresses a direct need expressed by OSWER's National Decontamination Team (NDT). In addition, the project is relevant to the U.S. EPA's Office of Pesticide Programs (OPP) crisis exemption process and OPP's regulatory function under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The U.S. EPA has initiated the Taskforce on Research to Inform and Optimize (TRIO) chemical, biological, and radiological (CBR) terrorist agent response across multiple offices within the Agency. The TRIO group consists of members from NHSRC, OSWER, OPP, and the Regional U.S. EPA offices (e.g., On-Scene Coordinators). TRIO is now replaced by PARTNER (Program to Align Research and Technology with the Needs of Environmental Response), NHSRC's Research Program Planning Tool for Aligning with Response Community Needs. Due to the potential relevance of this project in preparing for the Federal response to a wide-area anthrax dissemination, this project will be managed by NHSRC with the support of a multidiscipline project team.

V. BACKGROUND

Under Homeland Security Presidential Directive (HSPD)-10, the U.S. Department of Homeland Security (DHS) is tasked to coordinate with other appropriate Federal departments and agencies, to develop comprehensive plans which, "provide for seamless, coordinated Federal, state, local, and international responses to a biological attack." As part of these plans, the U.S. EPA, in a coordinated effort with DHS, is responsible for "developing strategies, guidelines, and plans for

decontamination of persons, equipment, and facilities" to mitigate the risks of contamination following a biological weapons attack.

NHSRC provides expertise and products that can be widely used to prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and incidents. Within NHSRC, DCMD's decontamination research program's goal is to provide expertise and guidance on the selection and implementation of decontamination methods and provide the scientific basis for a significant reduction in the time and cost of decontamination events. The NHSRC's research supports OSWER and OPP. OSWER, through its Special Teams which includes the NDT, supports the emergency response functions carried out by the Regional Offices. OPP supports the decontamination effort by providing expertise on biological agent inactivation and ensuring that the use of pesticides in such efforts is done in accordance with FIFRA. Close collaboration between the different program offices having homeland security responsibilities is sought in order to rapidly increase the U.S. EPA's capabilities to help the Nation recover from a terrorist event involving the intentional release of CBR materials. Such collaborations are fostered through efforts such as PARTNER.

In 2001, the introduction of a few letters containing anthrax spores into the U.S. Postal Service system resulted in the contamination of several facilities. Although most of the facilities in which these letters were processed or received in 2001 were heavily-contaminated, they were successfully remediated with approaches such as fumigation with chlorine dioxide or VHP®. It is well agreed that additional quick, effective and economical decontamination methods having the capacity to be employed over wide areas (outdoor and indoor) are required to increase preparedness for such a release.

In addition to fumigation used in primarily, heavily-contaminated facilities, other cleaning methods were used in secondarily contaminated (e.g., cross-contaminated letters potentially in contact with the anthrax spores containing letters or tracked from primarily contaminated sites) areas or primarily contaminated facilities showing a minimal presence of anthrax spores. These methods included combinations of disposal of contaminated items, vacuuming, and the use of liquid sporicides such as a pH-adjusted bleach solution. Additionally, a combined set of mechanical and chemical procedures (vacuum, scrub/wash and bleach) was successfully used in the decontamination of a small shed contaminated with natural anthrax spores originating from animal hides during a drum-making process[1]. If proven effective, such a "lower-tech" approach involving washing and cleaning with readily available equipment, washes and sporicides would significantly increase EPA's readiness to respond to a wide area release.

Previous studies with pH-adjusted bleach have demonstrated its effectiveness, yet also documented several downsides of this technology. Bleach is known to be corrosive to metals and its application often necessitates the use of specialized PPE due to chlorine off-gassing. This project will evaluate an alternative to bleach for 'low-tech' decontamination applications. The alternative decontaminant we will optimize is activated-peroxide. A benefit of a simple activated-peroxide solution is that hydrogen peroxide decomposes into water and oxygen, whereas bleach (hypochlorite) decomposes into chlorate and chloride ions, oxygen, and chlorine. Chlorine off-gassing from bleach can accumulate in a closed room and can be harmful when inhaled. A simple activated peroxide solution with no ingredients other than hydrogen peroxide,

buffer and an activator decomposes into water and oxygen and is considerably less corrosive than bleach.

VI. SCOPE

The purpose of this project is to determine the effectiveness and operational parameters for a particular liquid sporicide (activated peroxide) when used to decontaminate environmental surfaces contaminated with bacterial spores. In this study, overall effectiveness is determined by a method's ability to reduce and/or inactivate spores of *B. anthracis* or a relevant surrogate from a contaminated surface. In addition, relocation of viable spores to rinsates and aerosols, depending upon magnitude, may be indicative of an unsuccessful decontamination approach. An "expedient" or "low-tech" approach, for the purpose of this effort, is defined as procedures not requiring specialized materials or equipment (i.e., products available at a local hardware store).

The overall effectiveness of decontamination of larger coupons (14 in. x 14 in) shall be determined as a function of application and material type. Five indoor (Painted wood, stainless steel/glass, carpet, painted wallboard, linoleum) and three outdoor materials (Concrete, brick, unpainted wood) shall be used to test the effectiveness of the decontaminant. The materials shall be inoculated with *Bacillus atrophaeus* (formerly, *Bacillus globigii*) at 7 log colony forming units (CFUs) (+/- 0.5 log CFU). The decontamination solution shall be activated peroxide, formulation provided by Sandia National Labs. Each test shall include six replicate test coupons of one material type. Residual CFUs extracted from the test coupons compared to the number extracted from six positive controls shall be used as the measure efficacy. The pH and temperature of each solution shall be determined at the time of use in the efficacy testing.

The results of each task shall be documented in a draft data summary report discussing efficacy as a function of independent variables and operational factors. This draft data summary report shall be provided to the U.S. EPA Work Assignment Manager (EPA WAM) for review and comment. A final data summary report incorporating comments from the EPA WAM, and including a separate documentation of the disposition of comments, shall also be provided as the final deliverable on this work assignment. All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

VII. TECHNICAL APPROACH

The general approach that shall be used to meet the objectives of this project for both tasks is as follows, as briefly mentioned in the Section VI:

- inoculation of the materials with *Bacillus atrophaeus* (formerly, *Bacillus globigii*) spores via aerosol deposition using the procedures developed in Part 1 of this study (under EP-C-09-027, WA 0-25 and 1-25 for 14 in. x 14 in. coupons);
- application of prescribed decontamination methods or procedures;
- assessment of residual viable spores (via post-decontamination sampling), starting inoculation (via sampling of positive controls), and potential cross-contamination (via sampling of negative controls [blanks]);
- analysis of subsequent decontamination procedure residues (e.g., waste water or air samples);

- determination of decontamination effectiveness as measured by log reduction from the surfaces of test coupons compared to positive controls; and
- documentation of operational considerations (e.g., cross-contamination, procedural time, impacts on materials and personnel).

All sample analysis is outside of the scope of this work assignment. Samples shall be transferred to the National Risk Management Research Laboratory's (NRMRL) Air Pollution Prevention and Control Division's (APPCD)/ NHSRC Microbiology Lab for analysis under a separate work assignment (EP-C-09-027, WA 3-13).

VIII. AFFORDABILITY

Components of this study are expected to be somewhat labor intensive; the decontamination processes, sampling, and laboratory assays will require extensive human resources. Relative to the labor costs, only a minimal amount of expendable materials are required to be purchased by the contractor for use in this effort.

IX. TECHNICAL RISK

The technical risk involved in this project is thought to be minimal. The purpose of the effort is to provide information pertinent to the development of operational strategies for the decontamination methods included in the study. Hence, all information obtained in this project (whether intended or not) is expected to be significantly relevant to this purpose.

X. FACILITIES AND MATERIALS

All work on this project described in this statement of work (SOW) shall be performed at the U.S. EPA's facilities located at 109 T.W. Alexander Dr., Research Triangle Park, NC. This study shall be conducted in spray chamber located in H130A.

XI. TASKS

The technical approach to be used throughout this study shall be developed considering the background information provided in Section V and this section. This study shall be done in 3 major tasks. The specific details related to these tasks are described below.

Task I

A quality assurance project plan (QAPP) shall be drafted and provided to EPA for review and comment. After revision based upon EPA comments (as necessary) and approval by EPA, work may commence. Five Category 3/Applied Research QAPPs have been approved by the U.S. EPA for prior testing that have relevance to this effort.

- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 – Development and Evaluation of the Decontamination Procedural Steps (July 2009)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)
- Application Studies of Biological Agent Decontamination Methods (April 2008)

- Effectiveness of Physical and Chemical Cleaning and Disinfection Methods for Removing, Reducing or Inactivating Agricultural Biological Threat Agents (August 2010)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 4 – Optimization of Method Parameters and Impact of Surface Grime

These QAPPs shall be used as the basis for the QAPP for the specific work described in this SOW. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment package (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

All test activities shall be fully documented during the activity via narratives in laboratory journals, the use of digital photography and video. This information shall be incorporated into the final report, as warranted to document and convey the findings of this effort. The documentation should include, but not be limited to, record of time required for each decontamination step or procedure, visual observations during the procedures, any deviations from the test plans, physical impacts on the materials, and impacts on the decontamination or sampling personnel.

Task 2:
This WA requires the use of numerous 14" x 14" coupons constructed of building materials. Task 2 shall require the contractor to fabricate the required number of coupons of each building material type. Prototypes of each coupon type shall be inspected by the WAM prior to fabrication of the full amount required.

The material types shall be Painted wood, stainless steel or glass, carpet, painted wallboard, linoleum, concrete, brick, and unpainted wood. The coupon size of each material type shall be 14 in. by 14 in. by $\leq$2 in. The contractor shall record the source information and all methods used to fabricate material coupons. These data shall be included in the final deliverable.

Task 3:
Current operational procedures (developed from previous EPA and SNL/IBRD efforts) will be evaluated and refined through small-scale evaluation in a decontamination test chamber (e.g., 4'x4'x4' spray chamber). This evaluation will exercise the application procedures on a set of building materials and will be challenged with aerosol-deposited *Bacillus* spores. A key question addressed in this task is– is activated-peroxide efficacious on common building materials contaminated with aerosolized spores? Is this decontaminant effective on a variety of surfaces that have very different surface characteristics?

In Task 3, the effectiveness of two decontamination procedures shall be evaluated on sections of selected materials. Operational parameters such as processing time, physical impacts on

materials or decontamination crew, and fate of the viable spores (e.g., contamination of equipment, wash water, air) shall be determined.

The inoculation with *B. atrophaeus* shall be done in accordance with that described in the approved QAPP entitled, "Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 – Development and Evaluation of the Decontamination Procedural Steps (July 2009)."

The decontamination procedure will be developed in collaboration with Sandia National Labs (not part of this WA), and will be provided to the contractor for use in this study. The details of this procedure will be provided, the QAPP shall be amended by the contractor to reflect this addendum.

Surface sampling of coupons shall be conducted with wetted wipes or vacuum sock, depending upon material type.

Prior to initiation of testing, confirmation of the need (or need not) to use neutralizer may need be performed. If requested by the WAM, this testing shall be done by sampling a blank decontaminated coupon, but having the sample extraction solution spiked with 1e7 spores. This shall be compared to a blank coupon (not decontaminated) sampled, also having the sample extraction solution spiked with 1e7 spores. Five replicate coupons of each type (decontaminated blank; blank) and of each material type (rough cut wood; stainless steel) shall be used. If a statistically significance difference exists between the two populations (CFUs for decontaminated blanks vs. CFUs for blanks) for each coupon type, then neutralization of samples post-collection shall be needed. Confirmation that the neutralization addition does not impact the CFU analysis shall be performed if deemed to be needed. All results from this testing on spore recovery shall be discussed with the WAM prior to initiation of the efficacy testing described under Task 1.

Six positive control coupons, six test coupons, and two negative controls (1 field blank, 1 procedural blank) of a material type shall be used in each test (Table 1). The positive control and test coupons shall be inoculated on the same day, at least 18 hours prior to application of the decontamination procedures defined in the approved final QAPP for this testing. After the decontaminated and blank coupons are visibly dry, at least overnight, all coupons shall be sampled with the prescribed sampling method Three stainless steel coupons shall be included as inoculation controls (inoculated and sampled with the positive controls). The order of sampling shall be all blanks, all test coupons, all positive controls, and all inoculation controls.

The runoff shall be collected for each material type. This runoff shall be analyzed for viable spores in accordance with the revised procedure used in "Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 - Development and Evaluation of the Decontamination Procedural Steps (July 2009)."

Air samples shall be taken within the test chamber during decontamination of each material type (one per material type). These samples shall be analyzed for viable spores.

Addition testing details related to Task 3 are as follows:

- The runoff of any liquid (rinsate) applied to the materials shall be collected, neutralized, and submitted to the APPCD Microbiology Lab for quantitative viable spore analysis via direct plating. This shall be done by collection of runoff in a sterilized container containing an appropriate amount of neutralizer. Aliquots of the runoff shall be taken and filtered (rinsed) for analysis, consistent with the modified approach developed under EP-C-09-027, WA 0-25.

- Rinse water shall be confirmed to be free of confounding levels of background contamination prior to the initiation of each test.

- Air samples shall be taken in the decontamination chamber during the decontamination process to indicate the presence of aerosolized viable spores. This samples shall be done in accordance with the air sampling described in the approved QAPP entitled, Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)."

- After the decontamination, all surfaces shall be allowed to become visibly dry before being sampled. After at least a period of one day, post-decontamination sampling shall be performed in accordance with the methods prescribed herein and defined in the approved final QAPP.

- All equipment (e.g., brushes, storage bins, etc.) shall be properly sterilized according to the procedures defined in the QAPP prior to the initiation of each test. The procedure is expected to be soaking or washing hard, non-porous materials with a pH-amended bleach solution. Proper decontamination includes selective verification of a representative number of items to be used in a test.

- After completion of each material with a test and after each test, the chamber and all contents shall be thoroughly decontaminated with a proven procedure.

- All samples shall be transferred to the APPCD Microbiology Lab in sterile primary independent packaging within sterile secondary containment containing logical groups of samples. All samples shall be accompanied by a completed chain of custody form.

- All microbiological analysis for samples described in this SOW shall be performed by the APPCD Microbiology Lab. This analysis is outside of the scope of this SOW.

- All tests shall be extensively and adequately photographed and video documented to convey the test procedures.

Table 1: Task 3 Test Matrix

Test Number	Decontamination Operation Evaluation	Material Type	Test Material
1	Procedure 1	Indoor	Glass
2			Stainless steel
3			Carpet
4			Tile
5			Linoleum
6	Procedure 2		Glass
7			Stainless steel
8			Carpet
9			Tile
10			Linoleum
11	Procedure 1	Outdoor	Concrete
12			Brick
13			Painted wood
14	Procedure 2		Concrete
15			Brick
16			Painted wood

The decontaminant application procedures shall be defined following preliminary testing at Sandia National Lab, and will be provided to the contractor prior to testing. The QAPP shall be updated by amendment to incorporate this addition.

Reporting

The contractor shall design an MS Excel data reporting sheet template prior to the start of any work that conveys all relevant information from a test. This template shall be approved by the EPA for use, prior to conducting any testing described in this SOW. All photographs and videos shall be properly documented, indicating the exact tests in which they were taken. A log (in MS Excel) of all photographs and videos shall be maintained with the electronic files. The log shall include a description of each photograph and video, and include the test number and date. All electronic files shall be stored in a project folder set up on the EPA's DTRL share drive. All information relevant to a test (reporting sheet, digital photographs, videos, log file) shall be transmitted to the EPA WAM within 1 week from the completion of the sample analysis. This data shall have been QA/QC'd by the contractor prior to transmission. Transmission shall occur via e-mail to the EPA WAM informing him/her that the data is ready for viewing.

A draft final report detailing the test results and lessons learned from the testing shall be submitted to the EPA WAM within 30 days following the completion of the testing and no later than **9/01/2012**. This report shall include documentation of the time required to complete each entire test procedure and all procedural steps. The report shall include any digital photos necessary to illustrate the findings. The draft report shall be submitted by the EPA WAM for review from within EPA, including a Quality Assurance review. A final report incorporating requested changes, correction, and clarification resulting from the review process shall be submitted by the contractor within 15 days from receiving the official comments from the EPA

WAM. A separate document detailing the response to comments shall also be submitted to the EPA WAM by the contractor with the final version of the report.

XII. DELIVERABLE SCHEDULE

The deliverables previously described in this SOW with the scheduled due date are shown in Table 2.

Table 2: Deliverable Schedule

Task	Deliverable	Due Date
1	Draft QAPP	4/18/2012
1	Final QAPP	15 days following receipt of EPA comments
1	Reporting of test data to WAM	1 week after completion of each test
3	Reporting of test data to WAM	1 week after completion of each test
3	Draft final report	9/01/2012
3	Final report	15 days after receiving comments from EPA

XIII. REPORTING REQUIREMENTS

- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- All data related to this project shall be stored on the U.S. EPA servers in the DTRL share folder.
- Data transfer to the EPA WAM shall occur within one week from the completion of data analysis.
- In lieu of final reports for each or any task, journal papers within each task may be submitted at the discretion of the EPA WAM. The papers shall be authored or co-authored by the EPA WAM, at the discretion of the WAM. To serve in lieu of the final report, the journal articles must contain all of the relevant information that would have appeared in the final report.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

XIV. REFERENCES

1. After Action Report – Danbury Anthrax Incident, U.S. EPA Region 1, September 19, 2008.

XV. AMENDMENT

Test failure occurred during Tests 1, 6, 8, 9, and 14; due to a faulty MDI dosing procedure. This amendment is to authorize repeating the above-mentioned tests, adhearing to all QA previously outlined for this project. These is no increase or

change in scope, only authorized repeat of Tests 1, 6, 8, 9, and 14. No change in schedule or deliverables.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	EVALUATION OF EXPEDIENT DECONT

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	Sections 2 and 4 of SOW

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Work Assignment 3-08 EVALUATION OF EXPEDIENT DECONTAMINATION OPTIONS WITH ACTIVATED PEROXIDE-BASED LIQUID SPORICIDES. The Contractor shall not incur costs on this work assignment until 04/01/12

The Alternate WAM is Joe Wood

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Worth Calfee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	3/29/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

STATEMENT OF WORK for WA 3-08

EVALUATION OF EXPEDIENT DECONTAMINATION OPTIONS WITH ACTIVATED PEROXIDE-BASED LIQUID SPORICIDES

***PROJECT#* C.2.3.1.08**

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TITLE
Evaluation of Expedient Decontamination Options with Activated Peroxide-based Liquid Sporicides.

I. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be April 1, 2012 through November 30, 2012.

II. SUMMARY OF OBJECTIVES

This work shall estimate the occurrence and potential reduction of viable bacterial spores (i.e., effectiveness) as a function of the remediation activities applied to various surfaces. The work will be completed as 3 tasks. The objective of this project is to conduct laboratory-scale efficacy tests to determine the sporicidal potential of specific test solutions under specific test conditions. Operational parameters such as processing time, physical impacts on materials or decontamination crew, and fate of the viable spores (e.g., contamination of equipment, wash water, and generation of bioaerosols) shall be determined.

III. RELEVANCE

This project supports the mission of the Decontamination and Consequence Management Division (DCMD) within the U.S. Environmental Protection Agency's (U.S. EPA) National Homeland Security Research Center (NHSRC) by providing relevant information pertinent to the decontamination of contaminated areas resulting from an act of terrorism. The project supports the NHSRC's strategic goals as described in detail in the Homeland Security Research Multi-year Strategic Plan (draft, November 26, 2008). Specifically, the project is relevant to Long-Term Goal 2 (LTG-2) which states, "The Office of Solid Waste and Emergency Response (OSWER) and other clients use homeland security research program products and expertise to improve the capability to respond to terrorist attacks affecting buildings and the outdoor environments." This project addresses a direct need expressed by OSWER's National Decontamination Team (NDT). In addition, the project is relevant to the U.S. EPA's Office of Pesticide Programs (OPP) crisis exemption process and OPP's regulatory function under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The U.S. EPA has initiated the Taskforce on Research to Inform and Optimize (TRIO) chemical, biological, and radiological (CBR) terrorist agent response across multiple offices within the Agency. The TRIO group consists of members from NHSRC, OSWER, OPP, and the Regional U.S. EPA offices (e.g., On-Scene Coordinators). TRIO is now replaced by PARTNER (Program to Align Research and Technology with the Needs of Environmental Response), NHSRC's Research Program Planning Tool for Aligning with Response Community Needs. Due to the potential relevance of this project in preparing for the Federal response to a wide-area anthrax dissemination, this project will be managed by NHSRC with the support of a multidiscipline project team.

V. BACKGROUND

Under Homeland Security Presidential Directive (HSPD)-10, the U.S. Department of Homeland Security (DHS) is tasked to coordinate with other appropriate Federal departments and agencies, to develop comprehensive plans which, "provide for seamless, coordinated Federal, state, local, and international responses to a biological attack." As part of these plans, the U.S. EPA, in a coordinated effort with DHS, is responsible for "developing strategies, guidelines, and plans for

decontamination of persons, equipment, and facilities" to mitigate the risks of contamination following a biological weapons attack.

NHSRC provides expertise and products that can be widely used to prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and incidents. Within NHSRC, DCMD's decontamination research program's goal is to provide expertise and guidance on the selection and implementation of decontamination methods and provide the scientific basis for a significant reduction in the time and cost of decontamination events. The NHSRC's research supports OSWER and OPP. OSWER, through its Special Teams which includes the NDT, supports the emergency response functions carried out by the Regional Offices. OPP supports the decontamination effort by providing expertise on biological agent inactivation and ensuring that the use of pesticides in such efforts is done in accordance with FIFRA. Close collaboration between the different program offices having homeland security responsibilities is sought in order to rapidly increase the U.S. EPA's capabilities to help the Nation recover from a terrorist event involving the intentional release of CBR materials. Such collaborations are fostered through efforts such as PARTNER.

In 2001, the introduction of a few letters containing anthrax spores into the U.S. Postal Service system resulted in the contamination of several facilities. Although most of the facilities in which these letters were processed or received in 2001 were heavily-contaminated, they were successfully remediated with approaches such as fumigation with chlorine dioxide or VHP®. It is well agreed that additional quick, effective and economical decontamination methods having the capacity to be employed over wide areas (outdoor and indoor) are required to increase preparedness for such a release.

In addition to fumigation used in primarily, heavily-contaminated facilities, other cleaning methods were used in secondarily contaminated (e.g., cross-contaminated letters potentially in contact with the anthrax spores containing letters or tracked from primarily contaminated sites) areas or primarily contaminated facilities showing a minimal presence of anthrax spores. These methods included combinations of disposal of contaminated items, vacuuming, and the use of liquid sporicides such as a pH-adjusted bleach solution. Additionally, a combined set of mechanical and chemical procedures (vacuum, scrub/wash and bleach) was successfully used in the decontamination of a small shed contaminated with natural anthrax spores originating from animal hides during a drum-making process[1]. If proven effective, such a "lower-tech" approach involving washing and cleaning with readily available equipment, washes and sporicides would significantly increase EPA's readiness to respond to a wide area release.

Previous studies with pH-adjusted bleach have demonstrated its effectiveness, yet also documented several downsides of this technology. Bleach is known to be corrosive to metals and its application often necessitates the use of specialized PPE due to chlorine off-gassing. This project will evaluate an alternative to bleach for 'low-tech' decontamination applications. The alternative decontaminant we will optimize is activated-peroxide. A benefit of a simple activated-peroxide solution is that hydrogen peroxide decomposes into water and oxygen, whereas bleach (hypochlorite) decomposes into chlorate and chloride ions, oxygen, and chlorine. Chlorine off-gassing from bleach can accumulate in a closed room and can be harmful when inhaled. A simple activated peroxide solution with no ingredients other than hydrogen peroxide,

buffer and an activator decomposes into water and oxygen and is considerably less corrosive than bleach.

VI. SCOPE

The purpose of this project is to determine the effectiveness and operational parameters for a particular liquid sporicide (activated peroxide) when used to decontaminate environmental surfaces contaminated with bacterial spores. In this study, overall effectiveness is determined by a method's ability to reduce and/or inactivate spores of *B. anthracis* or a relevant surrogate from a contaminated surface. In addition, relocation of viable spores to rinsates and aerosols, depending upon magnitude, may be indicative of an unsuccessful decontamination approach. An "expedient" or "low-tech" approach, for the purpose of this effort, is defined as procedures not requiring specialized materials or equipment (i.e., products available at a local hardware store).

The overall effectiveness of decontamination of larger coupons (14 in. x 14 in) shall be determined as a function of application and material type. Five indoor (Painted wood, stainless steel/glass, carpet, painted wallboard, linoleum) and three outdoor materials (Concrete, brick, unpainted wood) shall be used to test the effectiveness of the decontaminant. The materials shall be inoculated with *Bacillus atrophaeus* (formerly, *Bacillus globigii*) at 7 log colony forming units (CFUs) (+/- 0.5 log CFU). The decontamination solution shall be activated peroxide, formulation provided by Sandia National Labs. Each test shall include six replicate test coupons of one material type. Residual CFUs extracted from the test coupons compared to the number extracted from six positive controls shall be used as the measure efficacy. The pH and temperature of each solution shall be determined at the time of use in the efficacy testing.

The results of each task shall be documented in a draft data summary report discussing efficacy as a function of independent variables and operational factors. This draft data summary report shall be provided to the U.S. EPA Work Assignment Manager (EPA WAM) for review and comment. A final data summary report incorporating comments from the EPA WAM, and including a separate documentation of the disposition of comments, shall also be provided as the final deliverable on this work assignment. All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

VII. TECHNICAL APPROACH

The general approach that shall be used to meet the objectives of this project for both tasks is as follows, as briefly mentioned in the Section VI:

- inoculation of the materials with *Bacillus atrophaeus* (formerly, *Bacillus globigii*) spores via aerosol deposition using the procedures developed in Part 1 of this study (under EP-C-09-027, WA 0-25 and 1-25 for 14 in. x 14 in. coupons);
- application of prescribed decontamination methods or procedures;
- assessment of residual viable spores (via post-decontamination sampling), starting inoculation (via sampling of positive controls), and potential cross-contamination (via sampling of negative controls [blanks]);
- analysis of subsequent decontamination procedure residues (e.g., waste water or air samples);

- determination of decontamination effectiveness as measured by log reduction from the surfaces of test coupons compared to positive controls; and
- documentation of operational considerations (e.g., cross-contamination, procedural time, impacts on materials and personnel).

All sample analysis is outside of the scope of this work assignment. Samples shall be transferred to the National Risk Management Research Laboratory's (NRMRL) Air Pollution Prevention and Control Division's (APPCD)/ NHSRC Microbiology Lab for analysis under a separate work assignment (EP-C-09-027, WA 3-13).

VIII. AFFORDABILITY

Components of this study are expected to be somewhat labor intensive; the decontamination processes, sampling, and laboratory assays will require extensive human resources. Relative to the labor costs, only a minimal amount of expendable materials are required to be purchased by the contractor for use in this effort.

IX. TECHNICAL RISK

The technical risk involved in this project is thought to be minimal. The purpose of the effort is to provide information pertinent to the development of operational strategies for the decontamination methods included in the study. Hence, all information obtained in this project (whether intended or not) is expected to be significantly relevant to this purpose.

X. FACILITIES AND MATERIALS

All work on this project described in this statement of work (SOW) shall be performed at the U.S. EPA's facilities located at 109 T.W. Alexander Dr., Research Triangle Park, NC. This study shall be conducted in spray chamber located in H130A.

XI. TASKS

The technical approach to be used throughout this study shall be developed considering the background information provided in Section V and this section. This study shall be done in 3 major tasks. The specific details related to these tasks are described below.

Task I

A quality assurance project plan (QAPP) shall be drafted and provided to EPA for review and comment. After revision based upon EPA comments (as necessary) and approval by EPA, work may commence. Five Category 3/Applied Research QAPPs have been approved by the U.S. EPA for prior testing that have relevance to this effort.

- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 – Development and Evaluation of the Decontamination Procedural Steps (July 2009)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)
- Application Studies of Biological Agent Decontamination Methods (April 2008)

- Effectiveness of Physical and Chemical Cleaning and Disinfection Methods for Removing, Reducing or Inactivating Agricultural Biological Threat Agents (August 2010)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 4 – Optimization of Method Parameters and Impact of Surface Grime

These QAPPs shall be used as the basis for the QAPP for the specific work described in this SOW. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment package (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

All test activities shall be fully documented during the activity via narratives in laboratory journals, the use of digital photography and video. This information shall be incorporated into the final report, as warranted to document and convey the findings of this effort. The documentation should include, but not be limited to, record of time required for each decontamination step or procedure, visual observations during the procedures, any deviations from the test plans, physical impacts on the materials, and impacts on the decontamination or sampling personnel.

Task 2:
This WA requires the use of numerous 14" x 14" coupons constructed of building materials. Task 2 shall require the contractor to fabricate the required number of coupons of each building material type. Prototypes of each coupon type shall be inspected by the WAM prior to fabrication of the full amount required.

The material types shall be Painted wood, stainless steel or glass, carpet, painted wallboard, linoleum, concrete, brick, and unpainted wood. The coupon size of each material type shall be 14 in. by 14 in. by $\leq$2 in. The contractor shall record the source information and all methods used to fabricate material coupons. These data shall be included in the final deliverable.

Task 3:
Current operational procedures (developed from previous EPA and SNL/IBRD efforts) will be evaluated and refined through small-scale evaluation in a decontamination test chamber (e.g., 4'x4'x4' spray chamber). This evaluation will exercise the application procedures on a set of building materials and will be challenged with aerosol-deposited *Bacillus* spores. A key question addressed in this task is– Is activated-peroxide efficacious on common building materials contaminated with aerosolized spores? Is this decontaminant effective on a variety of surfaces that have very different surface characteristics?

In Task 3, the effectiveness of two decontamination procedures shall be evaluated on sections of selected materials. Operational parameters such as processing time, physical impacts on

materials or decontamination crew, and fate of the viable spores (e.g., contamination of equipment, wash water, air) shall be determined.

The inoculation with *B. atrophaeus* shall be done in accordance with that described in the approved QAPP entitled, "Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 – Development and Evaluation of the Decontamination Procedural Steps (July 2009)."

The decontamination procedure will be developed in collaboration with Sandia National Labs (not part of this WA), and will be provided to the contractor for use in this study. The details of this procedure will be provided, the QAPP shall be amended by the contractor to reflect this addendum.

Surface sampling of coupons shall be conducted with wetted wipes or vacuum sock, depending upon material type.

Prior to initiation of testing, confirmation of the need (or need not) to use neutralizer may need to be performed. If requested by the WAM, this testing shall be done by sampling a blank decontaminated coupon, but having the sample extraction solution spiked with 1e7 spores. This shall be compared to a blank coupon (not decontaminated) sampled, also having the sample extraction solution spiked with 1e7 spores. Five replicate coupons of each type (decontaminated blank; blank) and of each material type (rough cut wood; stainless steel) shall be used. If a statistically significance difference exists between the two populations (CFUs for decontaminated blanks vs. CFUs for blanks) for each coupon type, then neutralization of samples post-collection shall be needed. Confirmation that the neutralization addition does not impact the CFU analysis shall be performed if deemed to be needed. All results from this testing on spore recovery shall be discussed with the WAM prior to initiation of the efficacy testing described under Task 1.

Six positive control coupons, six test coupons, and two negative controls (1 field blank, 1 procedural blank) of a material type shall be used in each test (Table 1). The positive control and test coupons shall be inoculated on the same day, at least 18 hours prior to application of the decontamination procedures defined in the approved final QAPP for this testing. After the decontaminated and blank coupons are visibly dry, at least overnight, all coupons shall be sampled with the prescribed sampling method Three stainless steel coupons shall be included as inoculation controls (inoculated and sampled with the positive controls). The order of sampling shall be all blanks, all test coupons, all positive controls, and all inoculation controls.

The runoff shall be collected for each material type. This runoff shall be analyzed for viable spores in accordance with the revised procedure used in "Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 - Development and Evaluation of the Decontamination Procedural Steps (July 2009)."

Air samples shall be taken within the test chamber during decontamination of each material type (one per material type). These samples shall be analyzed for viable spores.

Addition testing details related to Task 3 are as follows:

- The runoff of any liquid (rinsate) applied to the materials shall be collected, neutralized, and submitted to the APPCD Microbiology Lab for quantitative viable spore analysis via direct plating. This shall be done by collection of runoff in a sterilized container containing an appropriate amount of neutralizer. Aliquots of the runoff shall be taken and filtered (rinsed) for analysis, consistent with the modified approach developed under EP-C-09-027, WA 0-25.

- Rinse water shall be confirmed to be free of confounding levels of background contamination prior to the initiation of each test.

- Air samples shall be taken in the decontamination chamber during the decontamination process to indicate the presence of aerosolized viable spores. This samples shall be done in accordance with the air sampling described in the approved QAPP entitled, Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)."

- After the decontamination, all surfaces shall be allowed to become visibly dry before being sampled. After at least a period of one day, post-decontamination sampling shall be performed in accordance with the methods prescribed herein and defined in the approved final QAPP.

- All equipment (e.g., brushes, storage bins, etc.) shall be properly sterilized according to the procedures defined in the QAPP prior to the initiation of each test. The procedure is expected to be soaking or washing hard, non-porous materials with a pH-amended bleach solution. Proper decontamination includes selective verification of a representative number of items to be used in a test.

- After completion of each material with a test and after each test, the chamber and all contents shall be thoroughly decontaminated with a proven procedure.

- All samples shall be transferred to the APPCD Microbiology Lab in sterile primary independent packaging within sterile secondary containment containing logical groups of samples. All samples shall be accompanied by a completed chain of custody form.

- All microbiological analysis for samples described in this SOW shall be performed by the APPCD Microbiology Lab. This analysis is outside of the scope of this SOW.

- All tests shall be extensively and adequately photographed and video documented to convey the test procedures.

Table 1: Task 3 Test Matrix

Test Number	Decontamination Operation Evaluation	Material Type	Test Material
1	Procedure 1	Indoor	Painted wood
2			Stainless steel/glass
3			Carpet
4			Painted wallboard
5			Linoleum
6	Procedure 2		Painted wood
7			Stainless steel/glass
8			Carpet
9			Painted wallboard
10			Linoleum
11	Procedure 1	Outdoor	Concrete
12			Brick
13			Unpainted wood
14	Procedure 2		Concrete
15			Brick
16			Unpainted wood

The decontaminant application procedures shall be defined following preliminary testing at Sandia National Lab, and will be provided to the contractor prior to testing. The QAPP shall be updated by amendment to incorporate this addition.

Reporting

The contractor shall design an MS Excel data reporting sheet template prior to the start of any work that conveys all relevant information from a test. This template shall be approved by the EPA WAM for use, prior to conducting any testing described in this SOW. All photographs and videos shall be properly documented, indicating the exact tests in which they were taken. A log (in MS Excel) of all photographs and videos shall be maintained with the electronic files. The log shall include a description of each photograph and video, and include the test number and date. All electronic files shall be stored in a project folder set up on the EPA's DTRL share drive. All information relevant to a test (reporting sheet, digital photographs, videos, log file) shall be transmitted to the EPA WAM within 1 week from the completion of the sample analysis. This data shall have been QA/QC'd by the contractor prior to transmission. Transmission shall occur via e-mail to the EPA WAM informing him/her that the data is ready for viewing.

A draft final report detailing the test results and lessons learned from the testing shall be submitted to the EPA WAM within 30 days following the completion of the testing and no later than **9/01/2012**. This report shall include documentation of the time required to complete each entire test procedure and all procedural steps. The report shall include any digital photos necessary to illustrate the findings. The draft report shall be submitted by the EPA WAM for review from within EPA, including a Quality Assurance review. A final report incorporating requested changes, correction, and clarification resulting from the review process shall be submitted by the contractor within 15 days from receiving the official comments from the EPA

WAM. A separate document detailing the response to comments shall also be submitted to the EPA WAM by the contractor with the final version of the report.

XII. DELIVERABLE SCHEDULE

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Table 2: Deliverable Schedule

Task	Deliverable	Due Date
1	Draft QAPP	4/18/2012
1	Final QAPP	15 days following receipt of EPA comments
1	Reporting of test data to WAM	1 week after completion of each test
3	Reporting of test data to WAM	1 week after completion of each test
3	Draft final report	9/01/2012
3	Final report	15 days after receiving comments from EPA

XIII. REPORTING REQUIREMENTS

- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- All data related to this project shall be stored on the U.S. EPA servers in the DTRL share folder.
- Data transfer to the EPA WAM shall occur within one week from the completion of data analysis.
- In lieu of final reports for each or any task, journal papers within each task may be submitted at the discretion of the EPA WAM. The papers shall be authored or co-authored by the EPA WAM, at the discretion of the WAM. To serve in lieu of the final report, the journal articles must contain all of the relevant information that would have appeared in the final report.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

XIV. REFERENCES

1. After Action Report – Danbury Anthrax Incident, U.S. EPA Region 1, September 19, 2008.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Statement of Work for Expanding Low-technology Decontamination Options with Activated Peroxide-based Materials (WARRP07)
Description:	Statement of Work for WARRP IA
Project ID:	C.2.3.1.08
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	IV
Security Classification:	Unclassified
Project Type:	Sampling and Analysis
QAPP Status 1:	Not Delivered
Vehicle Status:	New Vehicle
Vehicle Type:	IAG

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

No — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html)*

Before Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by contract. Developed in accordance with:
	Programmatic QA Project Plan developed in accordance with:
Not Applicable	Application of QA and QC activities to the single project covered by contract. QA Project Plan developed in accordance with:

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: QA Document developed according to NHSRC QMP, see attachment 1
NHSRC QMP	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

12/16/11		Ramona Alexander 12/16/11	
Worth Calfee NHSRC-DCMD Technical Lead Person	12/16/2011 Date	Eletha Roberts NHSRC-IO QA Staff Member	12/16/2011 Date

A sampling and analysis activity or project is typically defined as a study performed to generate data to either monitor parameters on a routine basis or to characterize a particular population for later studies. The following requirements should be addressed as applicable.

SECTION 1.0, PROJECT DESCRIPTION AND ORGANIZATION

1.1 The purpose of the study shall be clearly stated in the sampling and analysis plan (SAP).

1.2 Responsibilities and points of contact for each organization shall be identified in the SAP. This should include identification of key personnel and/or organization(s) responsible for sample collection and custody, analytical and/or process measurements, data reduction, report preparation, and quality assurance.

SECTION 2.0, SAMPLING

2.1 Sampling points for all measurements (*i.e.*, analytical, physical, and process, including locations and access points) shall be identified in the SAP whenever possible. If the specific locations cannot be identified at the time of plan generation, discuss the documentation and/or communication mechanism(s) for ensuring adequate information is captured to later identify sampling points.

2.2 The anticipated sampling frequency (*e.g.*, how many sampling events and how often events occur) and number of sample types (*e.g.*, metals, VOCs, SVOCs, *etc.*) taken at each event shall be provided.

2.3 The expected measurements (*i.e.*, specific analytes) planned for each sample type shall be summarized.

2.4 If applicable, known site_specific factors that may affect sampling procedures shall be described.

2.5 If applicable, any site preparation (*e.g.*, sampling device installation, sampling port modifications) needed prior to sampling shall be described.

2.6 Each sampling procedure to be used shall be discussed or referenced.

2.7 If compositing or splitting of samples is planned, the applicable procedures shall be described.

2.8 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

2.9 Containers used for sample collection, transport, and storage for each sample type shall be described.

2.10 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*) shall be described.

2.11 Requirements for shipping samples shall be described.

2.12 Holding times requirements shall be noted.

2.13 Procedures for tracking samples in the laboratory and for maintaining chain_of_custody when samples are shipped shall be described. COC procedures shall be described to ensure that sample integrity is maintained (labeling, seals, records).

2.14 Information to be recorded and maintained by field personnel shall be discussed.

SECTION 3.0, TESTING AND MEASUREMENT PROTOCOLS

3.1 Each analytical method to be used shall be referenced. This includes EPA-approved and other validated nonstandard methods.

3.2 If applicable, modifications to EPA_approved or other validated nonstandard methods shall also be described.

SECTION 4.0, QA/QC CHECKS

4.1 The SAP shall list and define all QC checks and/or procedures used for the project, both field and laboratory as needed.

4.2 For each specified QC check or procedure, required frequencies and acceptance criteria shall be included.

SECTION 5.0, DATA REDUCTION AND REPORTING

5.1 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

5.2 The reporting requirements (*e.g.*, units, reporting method [*e.g.*, wet or dry]) for each measurement and matrix shall be identified.

SECTION 6.0, REPORTING REQUIREMENTS

The deliverables expected from each organization responsible for field and/or analytical activities shall be described.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☒ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for

Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/q11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-08

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	EVALUATION OF EXPEDIENT DECONT

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee:	$0.00	LOE:
This Action:		$104,773.00	
Total:		$104,773.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee:	$104,773.00	LOE: 1,398
Cumulative Approved:	Cost/Fee:	$104,773.00	LOE: 1,398

Work Assignment Manager Name: Worth Calfee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/17/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-09

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Open Area Emission Sampling

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Open Area Emission Sampling
No costs shall be incurred on this WA prior to 04-01-12

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Brian Gullett (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-1534 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	3/26/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Work Assignment 3-09

Statement of Work

Open Area Emission Sampling

I. BACKGROUND

EPA is developing methods to sample open area sources for a broad array of pollutants. These methods include both aerial and ground-based mobile measurements. These methods are applicable to a variety of sources such as prescribed fires, landfills, agricultural operations, ordnance disposal, and area industrial sources. These measurements result in emission factors. Sampling fires, for example, makes use of the carbon balance method to determine emission factors. Emissions of interest include, PM, black carbon, organics, and metals, among others.

This proposed work represents a continuation of the previous year's work.

II. PURPOSE

Field and laboratory-based measurements of open area sources, such as burning, will be used to derive emission factors which can be input into dispersion models for predicting near-source concentrations and exposures. Potential field sources include controlled-burn agricultural fields, prescribed forest burns, ordnance disposal, wildfires, landfills and landfill fires, industrial flares, lagoons, and large area industrial facilities.

The sampled data will be used to derive emission factors and to make a comparison between field testing and laboratory simulations, as available. Other than emission factor data, the project intends to establish a sound scientific basis and agreement on methodology on how experiments should be undertaken to generate emission factors that will be scientifically accepted.

Background Information and Special Instructions

- The Contractor is expected to use government furnished equipment (GFE) for the work. This shall include aerial sampling equipment, ground-based sampling equipment, the open burn test facilities, the organic support analytical laboratory equipment, and related support equipment.

- Facility operating manuals for the above-mentioned devices shall be followed. Analytical methods and sampling procedures shall follow EPA protocols where practical and applicable.

- If sufficient funds are deemed available by the WAM and CO, the contractor shall send qualified personnel to at least one nationally-known conference for presentation of related results.

- The Contractor is advised that the output of this programmatic effort will be reports to external sponsors as well as scholarly, peer-review journal publications.

III. STATEMENT OF WORK

The Contractor shall undertake laboratory- and field-based work in the following areas:

Task 1. Emissions from Open Area Sampling

It is anticipated that the contractor shall conduct 30 bum test-days in the large open bum test facility using biomass or the small, temporary burn test facility with potentially alternative materials. At the written direction of the WAM, the contractor shall run the CEM sampling, the biomass sorting and preparation, the bum preparation, the conduct of the bum, and the facility clean up.

It is anticipated that the Contractor shall provide logistical and analytical support to two 2-week field sampling campaigns including aerial flight operations.

The contractor shall analyze target analytes for chemical analysis, including, at the discretion of the WAM, PM2.5 and PM10, black carbon, PXDD/PXDF, CO, CO2, volatiles, hydrocarbons, and PAHs.

Additional instructions shall be conveyed in writing by the WAM in accordance with the "Technical Direction" clause.

Task 2. E waste GEEP

The Contractor shall analyze and report on existing data from the GEEP electronic waste recycling plant study done in the past. Their reporting will take the form of writing assistance for a joumal article or articles to report the results. The analysis shall include emission factors and material balances. Approximately 4 weeks time is anticipated.

Task 3. Covanta

The Contractor shall provide assistance in reviewing past EPA data related to waste combustion as well as industry data in order to make recommendations on reducing emissions of PCDD/F from combustors. Their output shall be in the form of writing assistance for a report to an EPA industrial partner. Approximately two weeks time is anticipated.

Task 4. Ordnance Disposal

The Contractor shall support efforts to conduct open area emission sampling of ordnance disposal. Their efforts shall consist of equipment maintenance, supply of materials, transportation of equipment and supplies, equipment handling, and coordination and purchase of outside laboratory analyses. It is anticipated that approximately 25 Summa can analyses, 60 filter analyses for five metals each, and 20 explosives residues analyses will be required. It is anticipated that 10 weeks time is anticipated.

Task 5. Maintenance

The Contractor shall provide support to maintain test facilities and equipment therein including the open bum test facility, ground ATVs and trailers, sampling equipment, and REMPI system. About 4 weeks time is anticipated.

Travel to one U.S.-based conference is anticipated as well as technical support travel to the field sampling mentioned above.

Task 6, QAPP

(1). The contractor shall review and modify existing relevant quality assurance plans at the discretion of the WAM.

- The modified QAPP shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page. Work involving environmental data shall not commence until the QAPP has received official approval from the EPA QA staff.

Reporting.

The Contractor shall ensure that all reporting requirements as specified by the Contract are met.

Quality Assurance.

The Contractor shall adhere to and ensure that all applicable QA/QC and safety and health rules and requirements are met. Since this work covers both development/adaptation of sampling methods to new, unsampled sources and measurement to determine emission factors, the contractor shall document quality assurance/control data as required for both Method Development projects and Measurement Projects (see Attachment #1 and #2) to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

Additional

Additional instructions will be conveyed in writing by the WAM in accordance with the "Technical Direction" clause.

IV. DELIVERABLES AND SCHEDULE

Deliverables

1. Weekly Meetings and E-Mail Reports: The WAM and contractor's project manager shall hold biweekly project meetings to discuss Task-specific progress, issues, and action items. The contractor project manager shall send an e-mail report to the WAM within one business day of this meeting, unless otherwise specified by the WAM. The e-mail report shall:

- Specify work goals and priorities for each Task under this work assignment;
- Document action item issues planned in the last weekly meeting for each Task;
- Specify the status of outstanding Task-specific test plans, QA plans, and safety plans; and
- Itemize issues and concerns that need resolution for each Task.

2. Monthly Task Progress and Cost Reports: The contractor's monthly report to EPA shall summarize work activities (accomplished and planned) for each Task in this work assignment, including the status of applicable test, QA, and safety plans. The monthly report shall also detail labor costs and ODC charges.

3. Health and Safety Protocols: Health and safety protocols for each Task shall be updated or prepared as required by the EPA ERC and APPCD safety personnel. These protocols shall be approved by the WAM and safety personnel prior to the conduct of any testing.

4. Quality Assurance Project Plan (QA/QC) and Test Plans: The contractor shall perform the activities described in these Tasks with reference to the QAPPs entitled

- U.S. EPA Evaluation of Dioxin Emissions Pre-testing Phase,

- Burning CCA-Treated Wood in the Open Burn Test Facility (OBTF),
- Development of analysis methods for the study of PCDD/F TEQ indicators, and
- Evaluation of Dioxin-Like Emissions from Residential Wood Combustion.
- Determination of Emission Factors from Open Burning and Open Detonation of Military Ordnance and its Addendum

5. Facility Manual(s): Relevant manuals shall be reviewed, updated, and approved as specified in QA requirements for facility manuals provided by the EPA QA office.

6. RCRA Compliance reports for activities conducted in the RCRA and Air permitted facility (as relevant): These reports shall be provided to the WAM and EPA personnel responsible for the permitted facility, upon request.

V. MILESTONES

The following milestones are identified:

- 20 days after WA award. The Contractor shall prepare a Work Plan and deliver to the PO and WAM.
- March 30, 2013. The Contractor shall complete testing and laboratory analysis on biomass burns including analytical determinations, procedural and QC documentation, and data QC checks.
- March 30, 2013. The Contractor shall complete logistical support and analytical support for up to two field sampling efforts.

Applicable sections of the contract include 1.1-1.6. 1.8, 2.0 – 7.0.

➢ Attachment 1. NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analytes(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5. MEASUREMENT PROCEDURES

5.1. Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2. If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. QUALITY METRICS (QA/QC CHECKS)

6.1. For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2. Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

Attachment 2. NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Provide a description of the situation that requires the generation of a new or modified method.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.
3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.
3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).
4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.
4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:

- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis
- describe procedures for packing and shipping samples, and provisions for maintaining chain-of-custody, as applicable

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). If a method/SOP will be developed, specify the required format.

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-09

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Open Area Emissions

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee: $0.00	LOE:
This Action:	$162,860.00	
Total:	$162,860.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee: $162,860.00	LOE: 1,704
Cumulative Approved:	Cost/Fee: $162,860.00	LOE: 1,704

Work Assignment Manager Name: Brian Gullett (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-1534 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 6/6/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Biocontaminant Laboratory Tech

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments: Amend 1

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	04/01/2009 To 03/31/2013	$359,964.00	
This Action:		$99,999.00	
Total:		$459,963.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	08/20/2012	Cost/Fee: $99,999.00	LOE: 1,363
Cumulative Approved:		Cost/Fee: $459,963.00	LOE: 7,067

Work Assignment Manager Name: Worth Calfee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 9/11/12 (Date)		Branch/Mail Code: CPAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Biocontaminant Lab Tech Suppor

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Worth Calfee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 8/1/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Biocontaminant Laboratory Technical Support
Statement of Work

Amendment #1

Project# C.2.2.1.9
(OMIS DCMD 4.12)
(APPCD ON-SITE CONTRACT EP-C-09-027, WA 3-13)

TABLE OF CONTENTS

I. TITLE: Biocontaminant Laboratory Technical Support

II. PERIOD OF PERFORMANCE

The period of performance for this work assignment shall be from the April 1, 2012 – March 31, 2013.

III. SUMMARY OF OBJECTIVES

The proposed work will provide microbiological support to on-going and planned research efforts conducted by EPA's National Homeland Security Research Center (NHSRC). Such support includes, but is not limited to, growth and maintenance of biological cultures and stocks; preparation of media and reagents used in microbiological analyses; organization, inventory, and upkeep of laboratory notebooks, glassware, equipment, and supplies; preparation of spore suspensions of various surrogate biological agents; sterilization of test materials and instruments; inoculation of coupons and materials used in decontamination studies; creation of new and update of existing MOPs used in decontamination research; and numerous laboratory analyses used to determine survivorship of biological agents in decontamination, disposal, and containment studies.

IV. RELEVANCE

The results of the work conducted under this WA study will be used to support other research projects related to the selection and application of candidate decontamination technologies for buildings or areas (i.e., indoor or outdoor scenarios) contaminated with biological warfare agents. Data generated through this work will also support containment and disposal-related homeland security research. The results of these works will be made available through published reports, journal papers, and conference abstracts and presentations.

V. BACKGROUND

Following a bioterrorist attack, materials contaminated with biological agent pose significant health threats. The EPA's NHSRC conducts research to develop methods and technologies able to rapidly and cost-effectively remediate areas affected by a bioterrorism attack. Tasks performed under this work assignment support such research.

VI. SCOPE

The objective of this work is to provide high-quality microbiological support to homeland security-related decontamination, disposal, and containment research projects. Most if not all of these projects being supported will be conducted via WAs under this contract as well. Such projects often require material coupons spiked with surrogate organisms as well as survivability analyses of coupons following treatment. For these tasks, laboratory technicians trained in aseptic techniques and general microbiological laboratory procedures shall carry out biological analyses on samples generated during decontamination, disposal, and containment research. Data generated and collected during these analyses shall be properly recorded and shared in a timely manner. In

addition, a significant amount of laboratory management is needed to sustain an efficient workflow.

VII. TECHNICAL APPROACH

Microbiological efforts will generally include the following activities: (1) preparation (e.g., sterilization) and analysis of coupons using various types of materials and biologicals (2) analysis of decontamination and containment research samples (3) developing standard diagnostic protocols for several decontamination technologies to assess microbial survivability (4) preparation of microbiological media and reagents (5) and timely reporting of data . Note: The treatment studies themselves (e.g., fumigation at specified conditions, rotary kiln operation, deposition studies, etc) will be conducted via the use of other WAs performed under this contract. The general purpose of this WA is to provide microbiological support for those other WAs. Additionally, projects may be initiated by the WAM in order to fully utilize personnel during periods of low workload.

The specific microbiological laboratory efforts will include (but not limited to) such things as the following:

(1) Spiking of coupons with the appropriate controls for any NHSRC decontamination, disposal, and/or containment projects.
(2) Growth and maintenance of the bacterial cultures used for the standard diagnostic protocols
(3) Perform the survivability analyses as required by the projects mentioned above.
(4) Develop standard diagnostic protocols if necessary to assess microbial survivability
(5) Prepare, sterilize, dispense, and confirm sterility of microbiological media.
(6) Properly destroy and dispose of contaminated/spiked testing materials
(7) Maintain laboratory notebooks, supplies, reagents, microbiological media, equipment, and certificates.
(8) Operation and maintenance of in–house microbiological instruments and equipment.
(9) Evaluate data acquired and prepare monthly reports documenting the results obtained, and the quality of the results. The reports shall include any tables, charts, graphs, drawings, or appendices necessary to fully explain the experiments performed, shall clearly document the results, and shall support the quality of data included.
(10) Provide the raw data to the WAM of this WA, and as well to the WAM of the project being supported. Data shall be provided electronically in a timely manner (as soon as available, not greater than 2 days following completion of the analysis generating said data) when requested or as indicated by a QAPP. All data sheets shall be legible, and contain all pertinent identifier information (i.e.,

technician name, date, number of WA being supported, analyses performed, organism, etc.)

(11) The contractor shall comply with all requirements as delineated on the QA requirement as defined in Attachment #1 to the SOW.

VIII. FACILITIES AND MATERIALS

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr. The Biocontaminant Laboratory located in E390 is a BSL-2 facility equipped with biological safety cabinets, microbial dynamic and static growth test chambers and bioaerosols test chambers as well as standard microbiological equipment such as steam autoclaves; incubators; refrigerators; centrifuges; light, fluorescent, and phase contrast microscopes, colony counters; and analytical balances.

IX. TASKS

To achieve the desired objective of this effort, the Microbiological work for this SOW can be broken down into four tasks.

Task 1. Coupon preparation and inoculation

The materials and size of the coupons shall be specified by the WAM based upon the inoculation and analytical procedures to be used, which will be specified in the QAPP for each WA the microbiology lab is supporting. There shall be three classes of coupons for each of the DCMD projects mentioned above: (1) positive controls, (2) negative controls, and (3) test coupons. The positive controls and test coupons shall be spiked with the appropriate *Bacillus* spores' concentration. The negative controls shall undergo the coupon preparation (e.g., sterilization), but shall not be spiked with any target. The spiking procedure shall be appropriately documented in the QAPP. Method demonstration shall be performed and deemed acceptable to the WAM of this WA in conjunction with the WAM of the project the microbiology lab is supporting, prior to the inoculation of the coupons. The basis for acceptability shall be the acceptance criteria set-forth in the QAPP. All positive control, negative control, and test coupons shall be transferred from and to the Biocontaminant lab according to the delivery schedule to be discussed for each project. All transfers shall be accompanied by chain-of-custody (COC) form.

The described procedures are for planning purposes only and may be changed by the WAM, in consultation with the contractor, within the level of effort anticipated for the SOW as currently written.

Task 2. Spore Survivability analyses.

Microbial growth on coupons will be evaluated qualitatively and quantitatively as specified in the standard operating procedures (MOPs 6516, 6526, 6527, 6528, 6529, 6535a, and MOP 6555 -6566) of the Biocontaminant Laboratory Facility manual, or as specified in a QAPP. Under the guidance of the WAM, the contractor shall develop standard diagnostic protocols if necessary to assess microbial survivability.

Task 3. Ancillary Research Projects
Additional projects may be designed and requested by the WAM to fully utilize the contractor personnel during periods of reduced workload. Such projects may include, but are not limited to: laboratory organization and cleaning, limit of detection studies, sampling efficiency studies, decontaminant technology application and efficacy studies, microbial characterization studies, bacterial spore purification studies, sampling and analysis methods development studies, and studies involving aerosol deposition of spores onto material surfaces. This task may require the contractor to briefly work in Highbay labs or other labs within the EPA-RTP facility.

Task 4. Laboratory Management
The efficiency of the Biocontaminant Laboratory workflow requires effective laboratory management. Therefore, the contractor shall maintain laboratory notebooks of all activities; keep all utilized equipment up-to-date with regards to certification and routine maintenance; maintain inventories of frequently utilized chemicals, reagents, and media as to prevent delays in experimentation due to insufficient supplies; carefully plan all work as to maximize the use of staff; maintain and update MOPs and MSDS repository; perform periodic disinfection of laboratory surfaces and biological safety cabinets; maintain temperature records for laboratory incubators, refrigerators, and freezers; and promptly inform the WAM of any issues associated with laboratory work, workload, equipment failures, or supply needs.

Task 5. Spore Recovery and Inoculum Preparations for Aerosol Testing Research
This task will involve providing microbiological support to on-going and new research initiatives involving aerosol testing. The Aerosol Test Facility (ATF) group will be utilizing spore preps, inoculated coupons, etc. prepared under this task. Also under this task, samples collected during bioaerosol testing within the ATF shall be analyzed for viable microorganisms. Approximately 2000 samples shall be analyzed by culture-based methods, and approximately 200 sample inocula shall be prepared over the course of this Task. The WAM will coordinate with those in the ATF group to ensure efficient transfer of samples between the laboratories. Data shall be reported to the WAM, and PI (indicated by the WAM), as data are available.

X. MILESTONES, DELIVERABLES, AND COMPLETION DATES

Data Delivery
Raw data (e.g., plate counts, qualitative growth results, etc.) shall be emailed to the WAM, and by carbon copy (cc) to the WAM of the project the microbiology lab is supporting, as soon as the data become available (not greater than 2 working days after completion of the analysis generating the data).

Reporting
The Contractor shall provide written monthly status reports using an MS WORD format to the EPA Biocontaminant lab WAM. The monthly reports shall be prepared specifying

the following: (1) summary of work conducted during the preceding month, including tables and/or charts using MS EXCEL format, as appropriate, with sufficient annotation as deemed adequate by the EPA WAMs, (2) analyses of the work in accordance to the expectations specified by the QAPP of each project, (3) progress on each task and the reason for any deviations from the project schedule, (4) work anticipated during the coming month. These reports shall be submitted electronically within 5 working days at the beginning of each month. Additionally, pdf copies of the laboratory notebook, including the pages documenting activities performed during the month, shall be created and delivered electronically to the WAM the same day the monthly report is delivered.

XI. RESPONSIBILITIES

This WA will be managed by the USEPA Office of Research and Development, National Homeland Security Research Center (NHSRC), Decontamination and Consequence Management Division (DCMD) in Research Triangle Park, NC. The Work Assignment Contractor Officer Representative will be M. Worth Calfee (phone 919-541-7600, email Calfee.Worth@epa.gov).

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Biocontaminant Laboratory Tech

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	Sections 1, 2, and 4 of SOW

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
No costs shall be incurred on this work assignment prior to 04-01-12

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Worth Calfee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	3/19/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Biocontaminant Laboratory Technical Support
Statement of Work

Project# C.2.2.1.9
(OMIS DCMD 4.12)
(APPCD ON-SITE CONTRACT EP-C-09-027, WA 3-13)

TABLE OF CONTENTS

I. TITLE: Biocontaminant Laboratory Technical Support

II. PERIOD OF PERFORMANCE

The period of performance for this work assignment shall be from the April 1, 2012 – March 31, 2013.

III. SUMMARY OF OBJECTIVES

The proposed work will provide microbiological support to on-going and planned research efforts conducted by EPA's National Homeland Security Research Center (NHSRC). Such support includes, but is not limited to, growth and maintenance of biological cultures and stocks; preparation of media and reagents used in microbiological analyses; organization, inventory, and upkeep of laboratory notebooks, glassware, equipment, and supplies; preparation of spore suspensions of various surrogate biological agents; sterilization of test materials and instruments; inoculation of coupons and materials used in decontamination studies; creation of new and update of existing MOPs used in decontamination research; and numerous laboratory analyses used to determine survivorship of biological agents in decontamination, disposal, and containment studies.

IV. RELEVANCE

The results of the work conducted under this WA study will be used to support other research projects related to the selection and application of candidate decontamination technologies for buildings or areas (i.e., indoor or outdoor scenarios) contaminated with biological warfare agents. Data generated through this work will also support containment and disposal-related homeland security research. The results of these works will be made available through published reports, journal papers, and conference abstracts and presentations.

V. BACKGROUND

Following a bioterrorist attack, materials contaminated with biological agent pose significant health threats. The EPA's NHSRC conducts research to develop methods and technologies able to rapidly and cost-effectively remediate areas affected by a bioterrorism attack. Tasks performed under this work assignment support such research.

VI. SCOPE

The objective of this work is to provide high-quality microbiological support to homeland security-related decontamination, disposal, and containment research projects. Most if not all of these projects being supported will be conducted via WAs under this contract as well. Such projects often require material coupons spiked with surrogate organisms as well as survivability analyses of coupons following treatment. For these tasks, laboratory technicians trained in aseptic techniques and general microbiological laboratory procedures shall carry out biological analyses on samples generated during decontamination, disposal, and containment research. Data generated and collected during these analyses shall be properly recorded and shared in a timely manner. In

addition, a significant amount of laboratory management is needed to sustain an efficient workflow.

VII. TECHNICAL APPROACH

Microbiological efforts will generally include the following activities: (1) preparation (e.g., sterilization) and analysis of coupons using various types of materials and biologicals (2) analysis of decontamination and containment research samples (3) developing standard diagnostic protocols for several decontamination technologies to assess microbial survivability (4) preparation of microbiological media and reagents (5) and timely reporting of data . Note: The treatment studies themselves (e.g., fumigation at specified conditions, rotary kiln operation, deposition studies, etc) will be conducted via the use of other WAs performed under this contract. The general purpose of this WA is to provide microbiological support for those other WAs. Additionally, projects may be initiated by the WAM in order to fully utilize personnel during periods of low workload.

The specific microbiological laboratory efforts will include (but are not limited to) such things as the following:

(1) Spiking of coupons with the appropriate controls for any NHSRC decontamination, disposal, and/or containment projects.
(2) Growth and maintenance of the bacterial cultures used for the standard diagnostic protocols
(3) Perform the survivability analyses as required by the projects mentioned above.
(4) Develop standard diagnostic protocols if necessary to assess microbial survivability
(5) Prepare, sterilize, dispense, and confirm sterility of microbiological media.
(6) Properly destroy and dispose of contaminated/spiked testing materials
(7) Maintain laboratory notebooks, supplies, reagents, microbiological media, equipment, and certificates.
(8) Operation and maintenance of in–house microbiological instruments and equipment.
(9) Evaluate data acquired and prepare monthly reports documenting the results obtained, and the quality of the results. The reports shall include any tables, charts, graphs, drawings, or appendices necessary to fully explain the experiments performed, shall clearly document the results, and shall support the quality of data included.
(10) Provide the raw data to the WAM of this WA, and as well to the WAM of the project being supported. Data shall be provided electronically in a timely manner (as soon as available, not greater than 2 days following completion of the analysis generating said data) when requested or as indicated by a QAPP. All data sheets shall be legible, and contain all pertinent identifier information (i.e.,

technician name, date, number of WA being supported, analyses performed, organism, etc.)

(11) The contractor shall comply with all requirements as delineated on the QA requirement as defined in Attachment #1 to the SOW.

VIII. FACILITIES AND MATERIALS

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr. The Biocontaminant Laboratory located in E390 is a BSL-2 facility equipped with biological safety cabinets, microbial dynamic and static growth test chambers and bioaerosols test chambers as well as standard microbiological equipment such as steam autoclaves; incubators; refrigerators; centrifuges; light, fluorescent, and phase contrast microscopes, colony counters; and analytical balances.

IX. TASKS

To achieve the desired objective of this effort, the Microbiological work for this SOW can be broken down into four tasks.

Task 1. Coupon preparation and inoculation

The materials and size of the coupons shall be specified by the WAM based upon the inoculation and analytical procedures to be used, which will be specified in the QAPP for each WA the microbiology lab is supporting. There shall be three classes of coupons for each of the DCMD projects mentioned above: (1) positive controls, (2) negative controls, and (3) test coupons. The positive controls and test coupons shall be spiked with the appropriate *Bacillus* spores' concentration. The negative controls shall undergo the coupon preparation (e.g., sterilization), but shall not be spiked with any target. The spiking procedure shall be appropriately documented in the QAPP. Method demonstration shall be performed and deemed acceptable to the WAM of this WA in conjunction with the WAM of the project the microbiology lab is supporting, prior to the inoculation of the coupons. The basis for acceptability shall be the acceptance criteria set-forth in the QAPP. All positive control, negative control, and test coupons shall be transferred from and to the Biocontaminant lab according to the delivery schedule to be discussed for each project. All transfers shall be accompanied by chain-of-custody (COC) form.

The described procedures are for planning purposes only and may be changed by the WAM, in consultation with the contractor, within the level of effort anticipated for the SOW as currently written.

Task 2. Spore Survivability analyses.

Microbial growth on coupons will be evaluated qualitatively and quantitatively as specified in the standard operating procedures (MOPs 6516, 6526, 6527, 6528, 6529, 6535a, and MOP 6555 -6566) of the Biocontaminant Laboratory Facility manual, or as specified in a QAPP. Under the guidance of the WAM, the contractor shall develop standard diagnostic protocols if necessary to assess microbial survivability.

Task 3. Ancillary Research Projects
Additional projects may be designed and requested by the WAM to fully utilize the contractor personnel during periods of reduced workload. Such projects may include, but are not limited to: laboratory organization and cleaning, limit of detection studies, sampling efficiency studies, decontaminant technology application and efficacy studies, microbial characterization studies, bacterial spore purification studies, sampling and analysis methods development studies, and studies involving aerosol deposition of spores onto material surfaces. This task may require the contractor to briefly work in Highbay labs or other labs within the EPA-RTP facility.

Task 4. Laboratory Management
The efficiency of the Biocontaminant Laboratory workflow requires effective laboratory management. Therefore, the contractor shall maintain laboratory notebooks of all activities; keep all utilized equipment up-to-date with regards to certification and routine maintenance; maintain inventories of frequently utilized chemicals, reagents, and media as to prevent delays in experimentation due to insufficient supplies; carefully plan all work as to maximize the use of staff; maintain and update MOPs and MSDS repository; perform periodic disinfection of laboratory surfaces and biological safety cabinets; maintain temperature records for laboratory incubators, refrigerators, and freezers; and promptly inform the WAM of any issues associated with laboratory work, workload, equipment failures, or supply needs.

X. MILESTONES, DELIVERABLES, AND COMPLETION DATES

Data Delivery
Raw data (e.g., plate counts, qualitative growth results, etc.) shall be emailed to the WAM, and by carbon copy (cc) to the WAM of the project the microbiology lab is supporting, as soon as the data become available (not greater than 2 working days after completion of the analysis generating the data).

Reporting
The Contractor shall provide written monthly status reports using an MS WORD format to the EPA Biocontaminant lab WAM. The monthly reports shall be prepared specifying the following: (1) summary of work conducted during the preceding month, including tables and/or charts using MS EXCEL format, as appropriate, with sufficient annotation as deemed adequate by the EPA WAMs, (2) analyses of the work in accordance to the expectations specified by the QAPP of each project, (3) progress on each task and the reason for any deviations from the project schedule, (4) work anticipated during the coming month. These reports shall be submitted electronically within 5 working days at the beginning of each month. Additionally, pdf copies of the laboratory notebook, including the pages documenting activities performed during the month, shall be created and delivered electronically to the WAM the same day the monthly report is delivered.

XI. RESPONSIBILITIES

This WA will be managed by the USEPA Office of Research and Development, National Homeland Security Research Center (NHSRC), Decontamination and Consequence Management Division (DCMD) in Research Triangle Park, NC. The Work Assignment Contractor Officer Representative will be M. Worth Calfee (phone 919-541-7600, email Calfee.Worth@epa.gov).

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Biocontaminant Laboratory Technical Support	
Description:	Work Assignment for Biolab	
Project ID:	C.2.2.1.9 (formerly DCMD 4.12)	
Status:	Original	
Number Ammended:		
QA Category:	III; IV	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Sampling and Analysis	
QAPP Status 1:	Not Applicable	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-09-027
	Work Assignment Number:	3-13
	Delivery/Task Order Number:	n/a
	Modification Number:	0
	Other:	n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?

(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

N/A — Has a QAPP already been approved for the activities specified in the SOW?

N/A — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use

by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with: Explain: Multiple projects will be used for this SOW but each project must have must have an approved QAPP before work begin.
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Documentation will be identified in individual Statements of Work	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Signature on file		Ramona Sherman MAR 6 2012	
Worth Calfee NHSRC-DCMD Technical Lead Person	03/06/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	03/06/2012 Date

QAPP REQUIREMENTS FOR SAMPLING AND ANALYSIS PROJECTS
(from Appendix B of the NHSRC QMP)

A sampling and analysis activity or project is typically defined as a study performed to generate data to either monitor parameters on a routine basis or to characterize a particular population for later studies. The following requirements should be addressed as applicable

SECTION 1.0, PROJECT DESCRIPTION AND ORGANIZATION

1.1 The purpose of the study shall be clearly stated in the sampling and analysis plan(SAP).

1.2 Responsibilities and points of contact for each organizatcn shall be identified in the SAP. This should include identification of key personnel and/or organization(s) responsible for sample collection and custody, analytical and/or process measurements, data reduction, report preparation, and quality assurance.

SECTION 2.0, SAMPLING

2.1 Sampling points for all measurements (*i.e.*, analytical, physical, and process, including locations and access points) shall be identified in the SAP whenever possible. If the specific locations cannot be identified at the time of plan generation, discuss the documentation and/or communication mechanism(s) for ensuring adequate information is captured to later identify sampling points.

2.2 The anticipated sampling frequency (*e.g.*, how many sampling events and how often events occur) and number of sample types (*e.g.*, metals, VOCs, SVOCs, *etc.*) taken at each event shall be provided.

2.3 The expected measurements (*i.e.*, specific analytes) planned for each sample type shall be summarized.

2.4 If applicable, known site_specific factors that may affect sampling procedures shall be described.

2.5 If applicable, any site preparation (*e.g.*, sampling device installation, sampling port modifications) needed prior to sampling shall be described.

2.6 Each sampling procedure to be used shall be discussed or referenced.

2.7 If compositing or splitting of samples is planned, the applicable procedures shall be described.

2.8 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

2.9 Containers used for sample collection, transport, and storage for each sample type shall be described.

2.10 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*) shall be described.

2.11 Requirements for shipping samples shall be described.

2.12 Holding times requirements shall be noted.

2.13 Procedures for tracking samples in the laboratory and for maintaining chain_of_custody when samples are shipped shall be described. COC procedures shall be described to ensure that sample integrity is maintained(labeling, seals, records).

2.14 Information to be recorded and maintained by field personnel shall be discussed.

SECTION 3.0, TESTING AND MEASUREMENT PROTOCOLS

3.1 Each analytical method to be used shall be referenced. This includes EPA-approved and other validated nonstandard methods.

3.2 If applicable, modifications to EPA_approved or other validated nonstandard methods shall also be described.

SECTION 4.0, QA/QC CHECKS

4.1 The SAP shall list and define all QC checks and/or procedures used for the project, both field and laboratory as needed.

4.2 For each specified QC check or procedure, required frequencies and acceptance criteria shall be included.

SECTION 5.0, DATA REDUCTION AND REPORTING

5.1 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

5.2 The reporting requirements (*e.g.*, units, reporting method [*e.g.*, wet or dry]) for each measurement and matrix shall be identified.

SECTION 6.0, REPORTING REQUIREMENTS

The deliverables expected from each organization responsible for field and/or analytical activities shall be described.

Attachment # 2

NHSRC QA

To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☑ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☑ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Biocontaminant Laboratory Tech

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	1A

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$359,964.00	
Total:	$359,964.00	

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 04/20/2012	$359,964.00	5,704
Cumulative Approved:	$359,964.00	5,704

Work Assignment Manager Name: Worth Calfee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/17/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Thermal Destruction of CBR Con

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments: Add additional Task 8

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	04/01/2009 To 03/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Paul Lemieux (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0962 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 9/19/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Introduction

Testing was performed under WA 2-41 for this contract to examine the combustion of cesium-containing biomass in the Rainbow furnace, with the addition of sorbent to evaluate the sorbents' ability to capture cesium from the furnace flue gases. Testing for WA 2-41 was completed with the exception of 1 test condition, and analysis of data and reporting is occurring under WA 3-14. Based on analysis of the data, it was determined that it is necessary to run the test matrix using a different biomass (Pine Flour).

Additional Tasks

Task 8) The contractor shall run additional cesium contaminated biomass combustion experiments performed on the Rainbow furnace in the same manner as performed under previous WA 2-41, using the existing QAPP developed under WA 2-41. The following run conditions, along with associated sampling and analytical activities as per WA 2-41 and its QAPP, shall be performed in triplicate, for a total of approximately 10 days of testing:

- Corn Flour/Cesium/Sorbent
- Pine Flour Alone
- Pine Flour/Cesium
- Pine Flour/Cesium/Sorbent

Additional elemental analysis of the sorbent material shall be performed using X-Ray Fluorescence (XRF).

Deliverables

The existing Health and Safety Plan (HASP) and QAPP from WA 2-41 shall be delivered to the WAM to be sent to the NHSRC QAM to be attached to WA 2-41.

The contractor shall provide data reports from all experiments on the Rainbow furnace and subsequent analysis, including any elemental analysis of the various materials being burned in the experiments to the EPA WAM..

Schedule

The additional testing will occur during the October-December 2012 timeframe.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Thermal Destruction of CBR Con

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	1.0, 2.0, 3.0, 4.0, 5.0, 6.0

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
No costs shall be incurred on this work assignment prior to 04-01-2012

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	04/01/2009 To 03/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Paul Lemieux (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0962 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus 3/22/12 (Signature) (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

SCOPE OF WORK
for
Thermal Destruction of CBR Contaminants

PURPOSE OF WORK ASSIGNMENT

The contractor shall provide support for operation, maintenance, sampling/analysis, and modification to the bench-scale thermal destruction reactor and the open burning test facility. *This work assignment is applicable to Contract Sections 1.2, 2.0, 3.0, 4.0, 5.0, and 6.0.*

BACKGROUND

This project supports the Decontamination and Consequence Management Division within EPA's National Homeland Security Research Center. In the event of a terrorist attack on a building our outdoor area using chemical/biological/radiological (CBR) contaminants, a significant amount of the material in the building may be disposed of through thermal incineration. Similarly, disposal of waste resulting from an agro-terrorist event may also be disposed of through thermal treatment techniques.

The primary goal of this project is to examine phenomena associated with thermal destruction of decontamination waste.

This project has initially used simulants for biological weapons (BW)and chemical weapons (CW) agents, and now that the experimental methodologies have been worked out, will be performed using ultra-dilute CW agents (GB, HD, and VX), available from the Environmental Response Laboratory Network (ERLN) as 10 ppm GC/MS standards. The combustor behavior of BW agents can be simulated using harmless bacteria such as *Geobacillus stearothermophilus* and CW agents can be simulated using chemicals of similar volatility or chemical makeup such as Malathion, dimethyl methylphosphonate (DMMP), diisopropyl methylphosphonate (DIMP), or ethylene glycol. Some experiments will be performed using TETS, a rodenticide of concern as a TIC.

The majority of experiments will be performed inside a laboratory fume hood using small pipe enclosures (previously developed in this project) and a GC oven, to simulate heating behavior from a real incinerator.

The materials to be used and simulated will include, but not be limited to the following: concrete, asphalt, carpet, ceiling tiles, plywood, wallboard, seat cushions, and fabric. Agricultural materials may include plant matter, animal tissue (hamburger), or meat and bone meal (dry dog food).

DETAILED TASK DESCRIPTIONS

Task 1) The contractor shall clean up the Open Burning Test Facility (OBTF) from the last set of experiments that were performed in it so that it can be usable for subsequent experimental activities. It is expected that this will take 2 days of personnel in personal protective equipment necessary to protect the personnel from residual asbestos particles that may be in the OBTF.

Task 2) The contractor shall perform testing in a laboratory oven such as those found in a gas chromatograph, that mimic heating rates previously observed in the rotary kiln incinerator simulator, as per the existing QAPP. These tests will be performed on the ultra-dilute chemical agents GB, HD, and VX. A complete series of experiments (3 temperatures, 3 residence times, 7 replicates) will be performed on each compound.

Task 3) The contractor shall coordinate with the APPCD Organic Analytical Laboratory to receive samples and analyze them. The purchase of laboratory expendables will be required. There may be some method development work to assure reliable sampling and analysis from the pipe enclosures.

Task 4) The contractor shall provide support from a biology, chemistry, and safety standpoint to minimize cross contamination between samples, to assure valid sample collection, and to provide personnel protection.

Task 5) The contractor shall purchase any expendable materials for use in this project, including the feed materials (building materials), chemical simulants, and instrument calibration gases. Ultra-dilute CWAs will be supplied by EPA.

Task 6) The contractor shall provide fabrication support for the development of the in-situ electronic BI device that is under development.

Task 7) The contractor shall complete the data report writing for the cesium contaminated biomass combustion experiments performed on the Rainbow furnace.

Expected numbers of experimental runs are as follows, with minor adjustments in the experimental program to be submitted as written technical direction from the WAM, as long as the overall WA value does not increase:

- Bench-scale experiments with GB: 3 temperatures x 7 replicates x 3 residence times + associated blanks and controls
- Bench-scale experiments with HD: 3 temperatures x 7 replicates x 3 residence times + associated blanks and controls
- Bench-scale experiments with VX: 3 temperatures x 7 replicates x 3 residence times + associated blanks and controls

DELIVERABLES

1. Planning Meetings: The WAM and contractor's project manager shall arrange project meetings to discuss Task-specific progress, issues, and action items.

2. Monthly Task Progress and Cost Reports: The Contractor's monthly report to EPA shall summarize work activities (accomplished and planned) in this work assignment, including the status of applicable test, QA, and safety plans. The monthly report shall also detail labor costs and ODC charges.

3. Health and Safety Research Protocols: Health and safety research protocols shall be prepared or updated as required by the EPA Facility and APPCD safety personnel. These protocols shall be approved by the WAM and safety personnel prior to the conduct of any testing.

4. Documentation for any Fabricated Devices: As the temperature measurement device and grab sample device are developed, the contractor shall supply documentation for construction and operation of the devices suitable for inclusion in the RKIS facility manual.

5. Quality Assurance Project Plans (QAPPs) and Test Plans (QATPs): The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality

6. Final Report: The Contractor shall prepare Quality Control data reports of all facility-specific data in lieu of a final report. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Thermal Destruction of CB Contaminants
Description:	Examine phenomena associated with thermal destruction
Project ID:	DCMD C.4.1.1.1
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	
Security Classification:	Unclassified
Project Type:	Applied Research
QAPP Status 1:	Existing QAPP
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027 Work Assignment Number: 3-14 Delivery/Task Order Number: n/a Modification Number: n/a Other:

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Destuction of CB Contaminats August 2010

Does the QAPP require *any* revision by the contractor**

no

Yes — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

Provide the expected title for submission to QA staff for approval:

Destruction of CB Contaminants

Provide the approximate date for submission to QA staff for approval:

03/12/2012

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles. ?*

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: The QAPP developed August 2010 will be reviewed by EPA QA Manager.
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Paul Lemieux NHSRC-DCMD Technical Lead Person	03/12/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	03/12/2012 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions These studies are often pilot- or field-scale. The following requirements should be addressed as applicable

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described

1.3 Project objectives shall be clearly stated and identified as primary or nonprimary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified

2.2 All QA Managers and their relationship in the organizations(*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identifiedmeaning that organizations responsible for planning coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should he identified

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described

4.3 Any site preparation needed prior to sampling/monitoring shall be described

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data(*i.e.*, used to calculate the final concentration of a

critical parameter), the QAPP shall describe how the sampling equipment is calibratec, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified(*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed

8.3 The responsible party(-ies) for implementing corrective actions shall be identified

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP **QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program,

and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Thermal Destruction of CBR Con

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	1A

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee: $0.00	LOE:
This Action:	$192,637.00	
Total:	$192,637.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee: $192,637.00	LOE: 2,564
Cumulative Approved:	Cost/Fee: $192,637.00	LOE: 2,564

Work Assignment Manager Name: Paul Lemieux (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0962 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus 5/15/12 (Signature) (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	WA 3-15

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	Indoor Source Emissions

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
The ceiling is increased to the work plan amount of $127,440.00

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	04/01/2009 To 03/31/2013		
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Xiaoyu Liu (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2459 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 8/27/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☒ Amendment Number: 000002

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Indoor Source Emissions and Si

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments: Add Amend 2 to WA 3-15

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Xiaoyu Liu (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2459 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus (Signature): Renita Tyus (Date): 9/19/12		Branch/Mail Code: CPSD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Amendment 2 to Base FY12 Statement of Work

WA: Indoor Source Emissions and Sink Effect Study of Formaldehyde

1. Amendment to Scope of Work

From April 2012 to early August 2012, the contractor has conducted 4 small chamber building material tests for interlab comparison of formaldehyde measurement requested by California Air resource board (ARB), 5 bottle tests for formaldehyde Henry's law constant measurement, 11 micro chamber tests and 15 small chamber tests for formaldehyde reference material research. This amendment is to eliminate Task 3, Formaldehyde Biocide Study, in the original Statement of Work (SOW) and add the following scope of work.

1.1 Task 2. Henry's Law Constants Study

In addition to Task 2 of the original SOW, the contractor shall:

- Conduct two more small chamber tests using formaldhyde with surfactant solution. The total seven tests will include three different stirring speeds and three different temperatures plus one duplicate.
- Conduct up to thirty bottle tests to measure Henry's law constants of formaldehyde with another surfactant under different concentration and temperature. The selection of the surfactant will be discussed with EPA Work Assignment Manage (WAM).

1.2 Task 4. QAPP update

Due to the addition of the scope of work for Task 2, the contractor shall update the QAPP to describe the test procedures for small chamber testing and update the miscellaneous operation procedures (MOPs) accordingly.

2. Schedule of Tasks, Reports, and Deliverables

The Contractor shall submit the updated QAPP within 30 days of receiving the work assignment amendment and submit the test results within 2 weeks after the completion of each test. The

Contractor shall alert the WAM in advance if they expect a substantial delay in completing the task or submitting the deliverable.

3. Work Assignment and Level of Effort

The period of performance for this work assignment amendment is from the data this work assignment amendment is issued through March 31, 2013.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Indoor Source Emissions

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Indoor Source Emissions and Sink Effect Study of Formaldehyde
Contractor shall not begin work until 04/01/2012.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Xiaoyu Liu (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2459	
	FAX Number:	
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2708	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/14/12 (Date)	Branch/Mail Code: CPAD	
	Phone Number: 513-487-2094	
	FAX Number: 513-487-2109	

FY12 Statement of Work

WA 3-15

WA Title: Indoor Source Emissions and Sink Effect Study of Formaldehyde

1. Purpose

The overall objective of this project is to improve indoor air quality, public health and impact the green chemistry movement. This project is to investigate the formaldehyde source emissions and sink effect characteristics of consumer products on indoor air quality for supporting EPA's formaldehyde regulations and formaldehyde risk assessments.

This WA is a continuation of WA 2-15.

2. Background

Improving air quality and assuring the safety of chemicals are two of the seven priorities for USEPA announced by the administrator in January 2010. Formaldehyde is listed as a probable carcinogen by EPA. The US National Academy of Sciences (NAS) is conducting an expedited peer review of EPA's formaldehyde risk assessment. Formaldehyde research fits these priorities and EPA's Chemical Safety for Sustainability (CSS) program.

On July 7, 2010, Present Obama signed the Formaldehyde Standards for Composite Wood Products Act (S.1660). This legislation pre-empts a TSCA Section 21 Petition and requires EPA to implement on a national basis the California regulation of formaldehyde emissions from three types of pressed-wood products and finished goods containing these materials, produced or imported into the US, as determined by ASTM E-1333 or an "equivalent" test method. This far-reaching legislation requires that EPA establish processes for testing, certification, and labeling of pressed-wood materials and finished goods by January 31, 2013. Thus, there is an immediate and critical need to develop and demonstrate emissions test methodologies for finished goods and establish equivalency to formaldehyde emissions limits specified in the legislation. The creation

of well-characterized reference materials for formaldehyde emissions testing is very important to improve emissions measurement methods. A widely accepted formaldehyde standard source could be used by laboratories to calibrate an apparatus, assess a measurement method, identify and eliminate the uncertainties involved in these measurements. It could also enable international harmonization of formaldehyde chamber test methods. EPA is in collaboration with the National Institute for Standards and Technology (NIST) to conduct research on development and demonstration of a standard HCHO emissions source for evaluating emissions test chamber performance.

Additionally, EPA is conducting registration review for antimicrobial biocides that release formaldehyde. To help EPA address the potential risks to humans resulted from the use of biocides in occupational and residential settings, chamber studies and air monitoring data and model are needed to determine the amount of HCHO off-gassing from biocide-treated paint and detergents.

In 2011, the ARCADIS Contractor under Contract EP-C-09-027 WA 2-15 had: (1) conducted 8 small chamber and 2 large chamber tests for an interlaboratory comparison of formaldehyde emission testing organized by California Air Resources Board (ARB): (2) conducted 3 small chamber tests to evaluate the formaldehyde standard source (reference material) produced by EPA's contractor –Virginia Tech; and (3) measured formaldehyde Henry's law constants in aqueous with and without a surfactant under different concentrations and temperatures using developed analytical method in total of 26 tests. Under this WA, the Contractor shall provide technical support to EPA by conducting source emission tests in environmental chambers and providing data for formaldehyde source emission model evaluation.

3. Task Descriptions

The Contractor shall conduct the following tasks:

Task 1. Formaldehyde Standard Source Study

EPA's contractor, Virginia Tech, is developing the formaldehyde reference material for formaldehyde emissions testing to demonstrate the feasibility of using this source to evaluate

emissions test chamber performance. After the first round of small chamber emission tests by ARCADIS, Virginia Tech will provide more materials for further investigation and improvement. About ten tests are proposed for FY2012. Upon receiving the developed formaldehyde standard source, the Contractor shall measure the emissions rate and profile of the formaldehyde standard source in small chambers and report the results. The test procedures will follow the developed QAPP that was used for the tests in FY2011.

Task 2. Henry's Law Constants Study

The Contractor shall finalize the measurement of Henry's law constants in the surfactants and conduct up to five small chamber tests to measure formaldehyde emissions from a detergent with a biocide. The EPA Work Assignment Manager (WAM) will provide further written technical details for the small chamber tests to the Contractor. The data will be used to develop/evaluate IAQX models.

Task 3. Formaldehyde Biocide Study

In 2010, the contractor had conducted small chamber source emission tests of one biocide, Grotan, in paint. EPA will identify another biocide that will be a formaldehyde releaser. The Contractor shall conduct up to eight small chamber and three large chamber tests upon receiving the new biocide and paint. The test protocol for small chamber tests should follow the QAPP that was prepared for Grotan/paint tests. The EPA WAM will provide details for the large chamber tests. The data will be used to develop/evaluate IAQX models.

Task 4. QAPP Update

The quality assurance plan prepared by the Contractor was approved in 2011. With the change of scope of work, the Contractor shall write a QAPP amendment to include all tests/tasks changes for this work assignment. The contractor shall also add experimental approaches, sampling procedures, and other sections of the QAPP for the new tasks.

4. Schedule of Tasks, Reports, and Deliverables

The Contractor shall submit the updated QAPP within 30 days of receiving directions from the work assignment manager for the new tasks. The contractor shall also provide (1) test material information, (2) environmental data for each test, (3) sampling information, and (4) HPLC

analytical data in excel files. These shall be submitted to the WAM within 10 business days after each test.

The Contractor shall provide the EPA WAM monthly progress reports as specified in the contract. The Contractor shall alert the WAM in advance if they expect a substantial delay in completing the task or submitting the deliverable.

5. Suggested Skills

This project will require Contractor staff with the skill of modification and adaptation of scientific apparatus to meet project objectives. It is recommended that this Work Assignment be lead by a scientist or engineer with experience in testing product emissions and operating small environmental chambers.

6. Special Requirements

The Contractor shall provide necessary health and safety procedures, documentation, and training to Contractor staff to ensure safe conduct of the experiments at Contractor controlled facilities.

The contractor shall adhere to the QA requirements as delineated in Attachment #1 to the Statement of Work. Work shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

7. Work Assignment Manager Designation

The Work Assignment Manager (WAM) is:

Dr. Xiaoyu Liu
U.S. Environmental Protection Agency
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division
Indoor Environment Management Branch
Mail Code E305-03
Research Triangle Park, NC 27711
Telephone: .919-541-2459
Fax: 919-541-2157

E-mail: liu.xiaoyu@epa.gov

8. Work Assignment Duration and Level of Effort

The period of performance for this work assignment is from the date this work assignment is issued through March 31, 2013.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-15

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Indoor Source Emissions

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- [X] Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

The work plan is approved; however, a ceiling of $100,000 applies to this work assignment.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013 — Cost/Fee: $0.00 — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012 — Cost/Fee: $127,440.00 — LOE: 1,990

Cumulative Approved: — Cost/Fee: $127,440.00 — LOE: 1,990

Work Assignment Manager Name: Xiaoyu Liu (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2459 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/17/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

SOW FY 2012-2013
Period of Performance: 04/13/2012 – 03/31/2013
Work Assignment Manager (WAM): Scott A. Moore
Work Assignment Title: Ozone Standard Reference Photometer (SRP) Metrology Laboratory Support
Contract Number: EP-C-09-027
Work Assignment Number: 3-16

Introduction

In ambient air monitoring applications, gas concentration standards are required for the calibration and auditing of various ambient gas monitors. Because of the instability of ozone (O_3), the certification of O_3 concentrations as Standard Reference Materials (SRMs) is impossible. Therefore a Standard Reference Photometer (SRP) was developed as a primary standard to validate the linearity of other photometers when challenged with various concentrations of locally generated O_3 gas. An SOP (Standard Operating Procedure) is being prepared to assist the EPA (Environmental Protection Agency) operators of the NIST (National Institute of Standards and Technology) Standard Reference Photometer (SRP) in terms of operation, repairs, and verification.
A collaborative effort between NIST and EPA in the development of the original SRPs has become the basis for O_3 measurements globally. The SRP Program began in the early 1980's as collaborative effort between NIST and the EPA to design, construct, certify and deploy a network of identical O3 reference instruments. The design specifications called for an instrument with a standard uncertainty of ±2 nmol/mol (ppb_v) in the range of 0 nmol/mol to 100 nmol/mol and ±2% in the range of 100 nmol/mol to 1000 nmol/mol. Since the SRPs have been deployed, beginning in 1983; the performance of all SRP's has exceeded the design specifications. In the US, two (2) SRPs are maintained by NIST, one serving as the NIST standard and the other as a backup/travelling instrument. Eleven (11) additional SRPs are maintained by the EPA at various EPA Regional laboratories across the United States to facilitate requests for local access to authoritative (ie, NIST) reference standards. With current international network of SRPs total nearly fifty (50) SRPs worldwide that now includes instruments maintained in at least fifteen (15) countries. The international network is coordinated by the Bureau International des Poids et Mesures (BIPM) in France, which maintains the international responsibility for the comparison of national O_3 standards as the NIST does here in the United States.

Over the past several years, the network of NIST SRPs has undergone significant upgrades in its electronic systems, sampling configuration, and control software. Each SRP consists of a separate optical bench and two instrumentation modules (electronics and pneumatics). The UV photometer consists of a low-pressure mercury discharge lamp, UV filter, UV beam splitter, two absorption cells, and signal-processing electronics.
A new electronics module was designed as a plug-compatible replacement for the original unit to simplify upgrading of existing systems in May 2003. Several

improvements were made in the overall electronics module design to provide enhanced stability and to simplify operation.

I. Goal/Purpose

The objective of this Work Assignment (WA) is to provide support to the SRP Program (OAQPS) through the Metrology Laboratory (APPCD). This is a facility with the capabilities to validate and repair other SRPs in various regions in order to maintain NIST tractability. The following table has the Region Number, the location, the SRP Serial Number for that region and a contact name:

SRP	Region	Location	Name
8	8	Golden, CO	Joshua Rickard
36	9	Richmond, CA	Barbara Bates
4	10	Sacromento, CA	Jerry Freeman
10	4	Athens, GA	Mike Crowe
1	RTP	RTP, NC	Scott Moore
7	RTP	SRP7 to NIST	Scott Moore
13	7	Kansas City, KS	James Regehr
9	1	N. Chelmsfield, MA	Chris St. Germain
6	5	Chicago, IL	Scott Hamilton
3	2	Edison, NJ	Avraham Teitz
5	6	Houston, TX	John Lay

Each year SRP-01 and SRP-07 are taken to NIST for their annual Validation. In turn, SRP-07 is then shipped around the country to be compared to each of the regional SRPs in order to provide NIST traceability. SRP-07 is shipped back to RTP in-between each regional comparison (or as often as possible) to check the status of the instrument. In turn various state and local authorities are able to go to a regional office to compare their lab standard or transfer standard and be able to maintain NIST tractability throughout the Ozone monitoring program.

II. Background Information

Data Uses — Primary users of the products of this WA will be researchers and operators of Ozone monitoring equipment in EPA/APPCD facilities. There are various groups that have Ozone monitoring equipment that may call on EPA for validation, such as Alion, Arcadis, the State of NC and the State of Florida, the State of Virginia and other local researchers.

Lab Site — Work area is D360-A in EPA's Research Center in Research Triangle Park, NC.

Experience — Personnel assigned to this WA must be familiar with performing calibrations that the Metrology Laboratory can provide, which include

electrical work, plumbing, general experience with lab equipment and materials, a familiarity with the calibration of measurement devices, and a fundamental understanding of the principals behind the measurements.

III. Tasks: OZONE SRP Laboratory Support

Task I. Shipping and Receiving of SRPs or other Ozone monitors

(1) The Contractor shall receive a SRP from one of the regions and unpack the equipment and set it up in D-360A in preparation of running a validation.

(2) The Contractor shall break down a SRP or Ozone monitor in preparation to ship the instrument or in preparation for the owner of the equipment to pick it up from D360-A

(3) All shipping is paid for by OAQPS, therefore the Contractor shall relay shipping information m (i.e. container size, weight, destination, date and priority) to OAQPS for labels to be printed. The Contractor shall make arrangement to have the equipment picked up or delivered to D360-A.

(4) Some travel may be required to get the SRP from one location to another without using a shipping company, in these rare instances the contractor shall make arrangement to travel to a specified location to pick or drop off the SRP.

(5) The Contractor shall become familiar with the Draft SOP for the SRP (provided by the WAM) and also the Draft: Transfer Standards for Calibration of Air Monitoring Analyzers for Ozone (PDF) (67pp, 820 KB) - May 31, 2009 as found on the website: http://www.epa.gov/ttn/amtic/srpqa.html

Task II. MetLab Operations

(1) The Contractor shall maintain the Zero Air Supply used for the Ozone Lab. OAQPS purchased a new Zero Air Generator for the Ozone Lab in January of 2012. Now that the Zero Air Generator has been received and installed the contractor shall maintain a monthly and annual routine maintenance schedule and log for it. Supplies for the Zero Air Generator will be purchased by OAQPS.

(2) The Contractor shall perform minor repairs on the SRPs as per Technical Directives from the WAM

(3) The Contractor shall maintain a calibration schedule for various support instrumentation such as the Barometric Pressure Sensor, the STOLAB Temperature calibrator and the Fluke Digital Volt Meter. OAQPS will be responsible for the costs of calibration of these instruments and the Contractor shall relay these costs to OAQPS

(4) The Contractor shall copy any written or verbal exchange to OAQPS to the WAM.

(5) The contractor shall perform QA evaluation using Excel and Word templates provided with the SRP Software.

(6) The Contractor shall provide the WAM with any calibration that is performed for final approval, before it is released to any other entity.

(7) The WAM shall be copied on all correspondence to and from any laboratories and venders used in the completion of the tasks associated with the projects. Any documents or literature during any of these correspondences will also be made available to the WAM.

(8) Formatting of reports should be comparable to historical reporting (using the same or very similar format used during the previous year) and electronic files should be compatible with Agency Standard Software, such as MS Excel 2003, MS Word 2003 and Adobe Reader 9.0 or current agency standard software. Any data recorded by the Ozone instrument (i.e. ozone, temperature, pressure, UV intensity) are automatically entered into a formatted spreadsheet and it automatically calculates the statistical variance of each data set. To make changes to this format, without an intimate knowledge of how the NIST SRP Software uses it, would prevent the instrument from working. Therefore , the same formate should be used every time a calibration is performed. Hard copies of reports are acceptable; however, electronic copies are encouraged.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-16

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Ozone Standard Reference Photo

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/13/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period:	Cost/Fee:	LOE:
	04/01/2009 To 03/31/2013		
This Action:		$10,003.00	
Total:		$10,003.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	05/01/2012	Cost/Fee: $10,003.00	LOE: 183
Cumulative Approved:		Cost/Fee: $10,003.00	LOE: 183

Work Assignment Manager Name: Scott Moore (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-5104 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 7/10/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-17

☐ Other ☐ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fenceline & Fugitive Emissions

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee:	$0	LOE:
This Action:		$73,963.00	
Total:		$73,963.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 06/20/2012	Cost/Fee:	$73,963.00	LOE: 763
Cumulative Approved:	Cost/Fee:	$73,963.00	LOE: 763

Work Assignment Manager Name: Eben Thoma (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7969 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 8/2/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-17

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fenceline and Fugitive Emissio

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Amendement 1 to WA 3-17 (stops work on tasks 5-8)

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Eben Thoma (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7969 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 6/5/12 (Date)	Branch/Mail Code: CPAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

SOW: Fenceline and Fugitive Emissions Measurement Techniques
EP-C-09-027 WA 3-17, Amendment 1

Background:

Reducing fugitive emissions of hazardous air pollutants (HAPs), other volatile organic compounds (VOCs), and certain inorganic gases from industrial facilities is an ongoing priority for EPA and our state and local co-regulators. Unlike stack emissions, fugitive releases are difficult to detect due to the spatial extent and inherent temporal variability of the potential sources. Yet, there are many regulatory requirements pursuant to the Clean Air Act (CAA) that are intended to limit the nature and extent of fugitive emissions without the benefits of area-wide emissions detection. For example, manual leak detection and repair (LDAR) programs using hand-held detectors, pursuant to the CAA and the implementing regulations at 40 C.F.R. subparts 61 and 63, help to limit fugitive emissions, however LDAR surveys are time-consuming and rely on attention to work practices that are often conducted poorly.

Fenceline and process monitoring by optical remote sensing (ORS), infrared cameras, mobile measurement, and emerging sensor techniques can augment existing LDAR programs by providing near real-time gas emissions data. Time-integrated passive sampling techniques are also important new fenceline screening technology approaches The detection of fugitive emission by a time-resolved monitors, coupled with wind direction data, can be used by the LDAR workers to pinpoint and repair fugitive leaks with short response times, greatly decreasing the potential for emissions.

This work Assignment (WA) continues previous efforts in the fenceline and fugitive emission topic area. Please refer to EP-C-09-027 WA: 2-17, 1-17, 2-36, 2-43, 2-63, 2-59 for further information on passive sampling, infrared cameras, deep ultraviolet optical sensor (DUVOS) technologies, and mobile monitoring with Geospatial Measurement of Air Pollution (GMAP) systems. This goal of this WA is to continue development of select aspects of these technologies, demonstrate them in the field where possible, and document through method development activities. It is envisioned that tasks will be added periodically to this WA.

Work involving collection of environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The Quality Assurance Project Plans (QAPPs) associated with these tasks shall be a Category III level (unless otherwise specified) and must include all necessary elements as described in the referenced documentation (See Attachment 1).

The contractor shall prepare (QAPP) for Task 3 of this work assignment. Tasks added under future WA Amendments and may require development of additional QAPPs. All QAPPs shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA

work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page.

Amendment 1 5/28/12:

Amendment 1 revises and adds tasks detailed below. In summary Tasks 1,3, and 4 are revised and work is stopped on Tasks 5, 6, 7, and 8.

Tasks and Deliverables:

Task 1: Development of a Deployment Plan (original Task 1)
Under the technical direction of the work assignment manager (WAM), the contractor shall participate in project planning activities with EPA and its collaborators for a three (3) month demonstration project of active open-path Fourier transform infrared (OP-FTIR) spectroscopy at a cooperating refinery in Carson City CA with data acquisition to begin August 1st, 2012. The contractor shall participate in bi-weekly coordination meetings that cover deployment and safety planning planing with the primary field study team. The Contractor shall identify and recommended the most cost-effective approach for obtaining high-quality, automated, near-real-time, spectroscopic and concentration data to be delivered to an automated website set up by the contractor or study team. The contractor shall prepare a deployment plan for review by the WA manager which includes an analysis of all aspects of proposed instrumentation, infrastructure, safety, data processing and handling, equipment deployment and insurance, quality assurance oversight, roles and responsibilities of parties, and preliminary schedule including deployment options. Regarding technology selection, preference shall be given to testing of most advanced (new to market) technology with highest degree of automation.

Original deliverable: The deployment plan shall be delivered by May 15th, 2012.

Amendment 1 revision to Task 1: Due to site access issues with regard to placement of the retoreflector on the property of the refinery (necessary for deployment of active OP-FTIR), the contractor shall pursue project planning with a scanning passive OP-FTIR imaging system which does not require a retroreflector. The contractor shall plan on a two month deployment of the technology with a starting date target of August 31st, 2012. The system shall be designed for near-real time alarming a data upload to a secure website.

Revised deliverable: The deployment plan shall be delivered by June 27th, 2012.

Task 2: Development of a QAPP (original Task 2)
Under the technical direction of the WAM, the contractor shall develop a quality assurance project plan (QAPP) for the field deployment detailed in Task1. The QAPP shall be a Category III level and must include all necessary elements as described in the referenced documentation (See Attachment 1). The QAPP shall include detailed analysis and operation SOPs for the selected FTIR system. The QAPP shall include procedures

for time synchronization of the FTIR system with other components of the fenceline monitoring demonstration study. The QAPP shall include full details on the automated data analysis and reporting procedures and post analysis quality assurance data processing tasks. The QAPP shall include roles and responsibilities for the FTIR operation in the context of the larger project.

Original deliverable: The QAPP shall be delivered 30 days after WAM approval of the deployment plan.

Amendment 1 revision to Task 2: No change to Task 2

Task 3: Execution of field study and delivery of data package (original Task 2)

The contractor shall execute the field study as per approved QAPP developed in Task 2. The study duration shall be 3 months starting August 1st 2012.

Original deliverables: The 3-month field study shall be completed, equipment removed, and the quality assured data package delivered by November 30th 2012. The data package shall include all concentration and atmospheric information, QA records, and FTIR spectra in native formats acquired during the study. The data package shall a summary of real-time data and data quality indicators along with brief descriptions of instrument operation issues and corrective actions taken

Amendment 1 revision to Task 3: The contractor shall execute the field study as per approved QAPP developed in Task 2. The study duration shall be 2 months starting August 31st 2012.

Revised deliverables: The 2-month field study shall be completed, equipment removed, and the quality assured data package delivered by December 30th 2012. The data package shall include all concentration and atmospheric information, QA records, and FTIR spectra in native formats acquired during the study. The data package shall a summary of real-time data and data quality indicators along with brief descriptions of instrument operation issues and corrective actions taken.

Task 4: DUVOS point monitor build (original Task 4)

Under the technical direction of the WAM, the contractor shall completed work to build one field prototype version of the DUVOS point monitor system including calibration check gear. The contractor shall utilize existing equipment where possible and shall develop a separate cost analysis for this task.

Original Deliverable: The date for system completion shall be June 30th 2012.

Amendment 1 revision to Task 4: Revised Deliverable due to EPA design delays.

Revised deliverable: The date for system completion shall be September 30th 2012.

Task 5: Respond to comments on R5 GMAP report (original Task 5)

See WA 2-59 for background information. The contractor shall respond to EPA comments on the report delivered under WA 2-59 (March, 2012) which summarized the

transfer GMAP technology to EPA Region 5 and the joint field test conducted in May 2011. The contractor shall develop a separate cost analysis for this task.

Original deliverable: Responses to comments and the revised report shall be delivered 30 days after receipt of comments.

Amendment 1 revision to Task 5: Stop work on Task 5. Due to a change in report strategy, EPA will incorporate select information delivered into a comprehensive report on GMAP technology development and transfer and methods and therefore no work to revise the R5 report will be required. Because comments where not provided to the contractor, this separately budgeted task under the contractor work plan shall be removed from the revised work plan.

Task 6: Respond to comments on FLIR database (original Task 6)
See WA 2-63 for background information. The contractor shall respond to EPA comments on the FLIR infrared camera database delivered under WA 2-59 (March, 2012). The contractor shall develop a separate cost analysis for this task.

Original deliverable: Responses to comments and the revised database shall be delivered 30 days after receipt of comments.

Amendment 1 revision to Task 6: Stop work on Task 6. Due to a change in report strategy, EPA will incorporate select information received in the previous deliverable into a combined report on FLIR and related 2010 and 2011 GMAP field studies and therefore no work to revise the FLIR infrared camera database will be required at this time. Because comments where not provided to the contractor, this separately budgeted task under the contractor work plan shall be removed from the revised work plan provided in response to Amendment 1.

Task 7: Respond to comments and Revise GMAP tool and Geospatial database (original Task 7)
Under WAs 2-43 and 2-59, GMAP databases and visualization tools were developed and delivered (March 2012). The contractor shall respond to EPA comments on these products and revise them as per these comments. The contractor shall develop a separate cost analysis for this task.

Original deliverable: Responses to comments and the revised database shall be delivered 30 days after receipt of comments.

Amendment 1 revision to Task 7: Stop work on Task 7 Due to a change in report strategy, EPA will incorporate select information received in the previous deliverable into a combined report on FLIR and related 2010 and 2011 GMAP field studies and therefore no work to revise the FLIR infrared camera a database will be required at this time. Because comments where not provided to the contractor, this separately budgeted task under the contractor work plan shall be removed in the revised work plan provided in response to Amendment 1.

Task 8: Respond to comments on GMAP REQ DA methods development package (Original Task 8)

See WA 2-43 for background information. Under WA 2-43, a method development package for the GMAP REQ DA was delivered (March, 2012). The contractor shall respond to EPA comments on these products and revise them as per these comments. The contractor shall develop a separate cost analysis for this task.

Original deliverable: Responses to comments and the revised GMAP REQ DA OTM method and design package shall be delivered 30 days after receipt of comments.

Amendment 1 revision to Task 8: Stop work on Task 8. Due to a change in reporting and method development strategy, EPA will incorporate select information delivered into a comprehensive report on GMAP technology development and transfer and methods and therefore no work to revise the GMAP REQ DA OTM method will be required. Because comments where not provided to the contractor, this separately budgeted task under the contractor work plan shall be removed in the revised work plan provided in response to Amendment 1.

ATTACHMENT #1
TO THE STATEMENT OF WORK (SOW)

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD:

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

☐ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

X **QAPP Requirements for Secondary Data Projects**

☐ **QAPP Requirements for Research Model Development and Application Projects**

☐ **QAPP Requirements for Software Development Projects**

X **QAPP Requirements for Method Development Projects**

☐ **QAPP Requirements for Design, Construction, and Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA=s Quality System Website: http://www.epa.gov/quality/
EPA=s Requirements and Guidance Documents:
http://www.epa.gov/quality/qa_docs.html

NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5. MEASUREMENT PROCEDURES

5.1. Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2. If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. QUALITY METRICS (QA/QC CHECKS)

6.1. For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2. Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
  7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
  7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-17

☐ Other ☒ Amendment Number: 000002

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fenceline

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	7.0

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
SOW for 3-17 Amendment 2

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Eben Thoma (Signature) (Date)		Branch/Mail Code: Phone Number 919-541-7969 FAX Number:
Project Officer Name Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name Renita Tyus Renita Tyus (Signature) 9/12/12 (Date)		Branch/Mail Code: CPSD Phone Number: 513-487-2094 FAX Number: 513-487-2109

SOW: Fenceline and Fugitive Emissions Measurement Techniques
EP-C-09-027 WA 3-17, Amendment 2

Background:

Reducing fugitive emissions of hazardous air pollutants (HAPs), other volatile organic compounds (VOCs), and certain inorganic gases from industrial facilities is an ongoing priority for EPA and our state and local co-regulators. Unlike stack emissions, fugitive releases are difficult to detect due to the spatial extent and inherent temporal variability of the potential sources. Yet, there are many regulatory requirements pursuant to the Clean Air Act (CAA) that are intended to limit the nature and extent of fugitive emissions without the benefits of area-wide emissions detection. For example, manual leak detection and repair (LDAR) programs using hand-held detectors, pursuant to the CAA and the implementing regulations at 40 C.F.R. subparts 61 and 63, help to limit fugitive emissions, however LDAR surveys are time-consuming and rely on attention to work practices that are often conducted poorly.

Fenceline and process monitoring by optical remote sensing (ORS), infrared cameras, mobile measurement, and emerging sensor techniques can augment existing LDAR programs by providing near real-time gas emissions data. Time-integrated passive sampling techniques are also important new fenceline screening technology approaches The detection of fugitive emission by a time-resolved monitors, coupled with wind direction data, can be used by the LDAR workers to pinpoint and repair fugitive leaks with short response times, greatly decreasing the potential for emissions.

This work Assignment (WA) continues previous efforts in the fenceline and fugitive emission topic area. Please refer to EP-C-09-027 WA: 2-17, 1-17, 2-36, 2-43, 2-63, 2-59 for further information on passive sampling, infrared cameras, deep ultraviolet optical sensor (DUVOS) technologies, and mobile monitoring with Geospatial Measurement of Air Pollution (GMAP) systems. This goal of this WA is to continue development of select aspects of these technologies, demonstrate them in the field where possible, and document through method development activities. It is envisioned that tasks will be added periodically to this WA.

Work involving collection of environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The Quality Assurance Project Plans (QAPPs) associated with these tasks shall be a Category III level (unless otherwise specified) and must include all necessary elements as described in the referenced documentation (See Attachment 1).

Tasks added under future WA Amendments and may require development of additional QAPPs. All QAPPs shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA

work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page.

Amendment 2 action summary 9/03/12:

Amendment 2 revises Tasks 2 and 3 and adds new Tasks 9 through 11. Based on the deliverable of Task 1 (received Aug. 2012), the available deployment options for the Carson City refinery project had both technical and project complications that could not be addressed with currently available funding. Tasks 2 and 3 are revised to reflect new project planning objectives for general fenceline measurement projects.

Task 2: Development of a QAPP and data analysis procedures for open-path facility fenceline monitoring

Under the technical direction of the work assignment manager (WAM), the contractor shall develop a quality assurance project plan (QAPP) for open-path equipment preparation, installation, operation, and data analysis for facility fenceline monitoring applications. The QAPP shall be generalized in form (performance-based) and shall also include (as appendices) details on a particular make/model open-path Fourier transform infrared (FTIR) and ultraviolet (UV) systems to be specified by the WAM. These appendices shall be in the form of standard operating procedures (SOPs) for the make/model specified and shall include sufficient engineering and operation description to fully detail operation and data analysis for a real-time facility fenceline monitoring deployments. The QAPP shall include in-field operation data quality assurance procedures in generalized terms (performance-based) and shall also include specific and detailed procedures for the FTIR UV systems to be specified by the WAM.

The QAPP shall be a Category III level and must include all necessary elements as described in the referenced documentation (see attachment 1). The QAPP shall be generalized with regard to roles and responsibilities of project participants. The contractor shall itemize hours and cost estimates for this task in the revised workplan.

Revised Deliverable: The QAPP shall be delivered by October 31, 2012.

Task 3: Support of fenceline monitoring projects

The contractor shall provide support to EPA's fugitive and area source group in the general development, preparation, and maintenance of fenceline measurement equipment. The contractor shall support the development of data analysis procedures for fenceline measurements and in the processing and analysis of fenceline data. The contractor shall revise and update fenceline measurement SOPs as required. The contractor shall provide data analysis support as required. The contractor shall provide short-form data analysis summary reports, including QA summaries, and raw/processed files and fits for data provided to the contractor on an as required basis. The contractor shall itemize hours and cost estimates for this task in the revised workplan.

Revised Deliverable: Data reports/packages shall be delivered 30 days after receipt of data or by March, 2013.

New Tasks added in Amendment 2 (9/3/12)

Task 9: Selection, development, testing, and deployment of low-cost sensors for facility fenceline measurements

Task 9.1: Under the technical direction of the WAM, the contractor shall research low cost sensors for acquisition consideration for the purpose of integration into a stand-alone package for use in a 6-month field campaign to be performed in conjunction with Task 10 of this work assignment. The evaluation shall include non-speciated and benzene-specific technologies. Technical details regarding the selection of the sensor(s) for purchase and the plan for their configuration in to a fieldable form shall be approved by the WAM prior to the contractor acquiring the sensor(s). The contractor shall attempt to leverage technical developments of WA 3-64 where possible and cost effective. The contractor shall investigate incorporation of the DUVOS system developed in Task 4 as a possible sensor technology. The package shall include remote data communication and monitoring capability. The package shall include all ancillary species measurements data to correct for anticipated interferences and include metrological measurements necessary for successful interpretation of the data in a fenceline monitoring field deployment. After preliminary review of options, the contractor shall provide an engineering plan for the selected sensor(s) package build including cost estimates.

Task 9.2: Upon approval of the sensor package build plan, the contractor shall develop a quality assurance project plan (QAPP) for pre-deployment evaluation of the sensor package. The contractor shall acquire the sensor components and other required equipment and construct the sensor package (if necessary). After acquisition of the sensor(s) and incorporation into a fieldable form, the contractor shall perform pre-deployment testing and evaluation of the sensor package systems and produce a test report to be included in the amended QAPP for field demonstration.

Task 9.3: Upon approval of the pre-deployment testing of sensor package performance by the WAM, the contractor shall amend the QAPP prepared under Task 10 of this work assignment to include deployment of the sensor package as part of the field trail. Upon approval of the amended QAPP, the contractor shall execute a six month demonstration of the sensor package. The contractor shall provide remote access to the sensor package to the WAM and continually review data to determine if corrective action is required. The contractor shall provide a short-form report including QA and data package to the WAM after the field deployment.

The QAPP shall be a Category III level and must include all necessary elements as described in the referenced documentation (see attachment 1).

The contractor shall itemize hours and cost estimates for each element this task in the revised workplan.

Deliverables

(1) Task 9.1: The engineering build plan shall be received by October 12, 2012

(2) Task 9.2: The pre-deployment testing QAPP(approved), sensor package build, and pre-deployment sensor package testing report shall be complete within 60 days after approval of the engineering build plan by the WAM.

(3) Task 9.3: The field testing QAPP amendment (approved) and full initiation of field testing shall occur within 60 days of approval of the pre-deployment sensor package testing report by the WAM.

Task 10: Development of a deployment plan and QAPP for passive sampler fenceline studies

Under the technical direction of the WAM, the contractor shall participate in project planning activities with EPA and its collaborators for a one year demonstration project of passive sampler and in an area of Philadelphia PA, near an operating refinery starting in the winter of 2012. The contractor shall support discussions of potential co-deployment of the of low-cost sensor technologies (Task 4, Task 9). The contractor shall support discussions for potential open-path data analysis support of data acquired by study collaborators (Task 3). The contractor shall participate in bi-weekly coordination meetings that cover deployment and safety planning with the primary field study team.

Task 10.1: The contractor shall identify and recommended the most cost-effective approach for executing the primary objective of a multi-site passive sampler deployments (detailed below) including acquisition of all ancillary data and specification of any required subcontracts. The contractor shall produce a deployment plan for review and approval of the WAM. The deployment plan shall contain itemized costs of project elements such as contractor sampler switch-out, outside laboratory analytical and open-path spectrum analysis costs, and equipment needs. The deployment plan will outline areas of leverage for potential inclusion of low-cost sensor technologies into the field study (Task 9).

The passive sampler study shall assume six (6) deployment locations. It is probable that four (4) of the deployment locations (sites) will be in Philadelphia PA with the other two (2) at alternate locations shall be discussed with the contractor (TBD). For initial planning purposes, it shall be assumed that each of the deployments sites shall include eight (8) collocated Carbopack X sampling tubes including duplicates and field blanks. The deployments shall be for two (2) weeks in duration for a period of one year and analysis shall include the following compound list:

1,2-Dichloro-1,1,2,2-tetrafluoroethane
1,3-Butadiene
Trichlorofluoromethane
1,1-Dichloroethene
1,1,2-Trichloro-1,2,2-trifluoroethane
1,1-Dichloroethane
cis-1,2-Dichloroethene
1,2-Dichloroethane

1,1,1-Trichloroethane
Benzene
Carbon tetrachloride
1,2-Dichloropropane
Trichloroethene
Toluene
Tetrachloroethene
Chlorobenzene
Ethylbenzene
m,p-Xylene
Styrene
o-Xylene
4-Ethyltoluene
1,3,5-Trimethybenzene
m-Dichlorobenzene
p-Dichlorobenzene
o-Dichlorobenzene

It shall be assumed that two (2) of the sites shall include canister acquisitions for comparison purposes.

Task 10.2: Upon approval of the deployment plan (Task 10.1), the contractor shall develop a quality assurance project plan (QAPP) for execution of the one-year field. The QAPP shall be a Category III level and must include all necessary elements as described in the referenced documentation (See Attachment 1).

Task 10.3: Upon approval of the QAPP (Task 10.2) and completion of all preparation details and safety plans, the contractor shall execute the field study as per the QAPP. The contractor shall provide monthly status updates to the team. Final reporting on the project shall be tasked under Option Period 4.

Deliverables

(1) Task 10.1: The deployment plan shall be received by October 19, 2012.

(2) Task 10.2: The QAPP (approved) and field preparations shall be complete within 60 days after approval of deployment plan by the WAM.

(3) Task 10.3: The field testing shall be initiated within 45 days of approval of the QAPP. Monthly update reports shall be provided starting 30 days after field study initiation.

The contractor shall itemize hours and cost estimates for each element this task in the revised workplan.

Task 11: Infrared camera report and database

The contractor shall expand upon work from previous WAs to compile a comprehensive report and video database for infrared camera observations. The report shall include

camera comparisons, an analysis of potential calibration schemes, and a review of technical operation principals. The report shall include a review or current operation procedures and improved quality assurance procedures. The report shall include an analysis of factors affecting detection sensitivity. The report shall include a summary of the expanded data base and updated image files and video files which can be accessed via hyperlink from report descriptions. The report shall be in EPA ORD format for public release upon completion of the peer review process.

The report and database shall be received by 1/31/13.

The contractor shall itemize hours and cost estimates for each element this task in the revised workplan.

ATTACHMENT #1
TO THE STATEMENT OF WORK (SOW)

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD:

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

☐ **NRMRL=s Quality System Specifications:**

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(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

☐ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

X **QAPP Requirements for Secondary Data Projects**

☐ **QAPP Requirements for Research Model Development and Application Projects**

☐ **QAPP Requirements for Software Development Projects**

X QAPP Requirements for Method Development Projects

☐ **QAPP Requirements for Design, Construction, and Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA=s Quality System Website: http://www.epa.gov/quality/
EPA=s Requirements and Guidance Documents:
http://www.epa.gov/quality/qa_docs.html

NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5. MEASUREMENT PROCEDURES

5.1. Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2. If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. QUALITY METRICS (QA/QC CHECKS)

6.1. For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2. Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
  7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
  7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-18

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	PFOA Article Testing

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
PFOA Article Testing
This WA is a continuation of WA 2-18.
The Alternate Work Assignment Manager is Xiaoyu Liu.
Contractor shall not begin work until 4/1/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 5)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Zhishi Guo (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-0185 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/20/12 (Date)		Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Contract: EP-C-09-27
Option 3
WA number: 3-18

Statement of Work

PFOA Aged Article Testing (Phase II)

I. Background and Objective

This WA is a continuation of WA 2-18.

Perfluorooctanoic acid (PFOA) is a surfactant associated with fluoropolymer and fluorotelomer products, and can cause developmental and other adverse effects in laboratory animals. It has been found at very low levels both in the environment and in the blood of the general U.S. population. Investigators have recently reported that PFOA concentrations in indoor air are much higher than those in ambient air. This finding suggests that some consumer products may be major PFOA sources in the indoor environment, and that indoor exposure (e.g., inhalation of dusts and dermal contact with consumer products) may constitute a significant portion of the total exposure to PFOA among the general population. It is known that a wide range of consumer products, also known as articles of commerce (AOCs) may contain PFOA. For instance, according to a recent study, one square meter of carpet treated with fluorotelomer-based stain repellent solutions may contain several hundred micrograms of PFOA. However, the role of these common consumer products on human exposure remains unclear, and there is no information on the release of PFOA during the life cycle of AOCs. EPA's Office of Pollution Prevention and Toxic (OPPT) is currently evaluating the potential health risks associated with PFOA and its analogues, collectively known as perfluorocarboxylic acids (PFCAs). This project – PFOA aged article testing – supports OPPT's data needs by: (1) characterizing the source, transport, and fate of PFOA in the indoor environment, (2) characterizing the factors that may affect PFOA release from consumer products, and (3) examining risk management options for reducing human exposure to PFOA. In the past three years, EPA has completed three reports on PFCAs in consumer articles. To further understand the role of consumer articles in human exposure, EPA is interested in the presence of PFCA precursors in consumer articles. Under this WA, the Contractor shall provide technical support to the Government by developing analytical methods for telomer alcohols (a class of PFCA precursors) and determining the concentrations of perfluorotelomer alcohols in AOC samples collected from the U.S. open market.

II. Scope of Work

Task 1. Development of miscellaneous operating procedures (MOPs) for determination of perfluorotelomer alcohols in AOC samples

Under the previous work assignment, the Contractor has conducted exploratory evaluation of the analytical methods for determination of perfluorotelomer alcohols in AOC samples. The Contractor shall complete this evaluation by developing MOPs for sample extraction and analysis.

Task 2. Determination of perfluorotelomer alcohols in articles of commerce

The Contractor shall determine the concentrations of telomer alcohols in AOC samples. The Contractor shall select AOC samples for analysis from two sources: (1) the AOC samples that the Contractor collected between 2007 and 2011 under previous work assignments, and (2) newly purchased AOC samples from the U.S. open market. The AOC categories shall include, but not limited to:

- Pre-treated carpeting
- Commercial carpet-care liquids
- Household carpet/fabric-care liquids and foams
- Treated apparel
- Treated home textile and upholstery
- Treated non-woven medical garments
- Treated floor waxes and stone/wood sealants
- Treated food contact paper

The Contractor shall make certain that the AOC samples collected cover both domestic and imported products (roughly 1:1). The WAM will provide further technical details to the Contractor no later than May 15, 2012 about the exact number of samples needed for this study.

Task 3. Determination of emissions of perfluorotelomer alcohols from selected articles of commerce

The Contractor shall use the μ-CTE Micro-Chamber/Thermal Extractor to determine the emissions of perfluorotelomer alcohols. The Contractor shall conduct tests in two steps: (1) determine the detection limit of the micro chamber method and (2) if feasible, determine the emission rates of major perfluorotelomer alcohols from a minimum of 12 AOC samples that contain high concentrations of perfluorotelomer alcohols.

III. QA/QC

The Contractor shall provide technical support for this project by following *Quality Assurances Project Plan (QAPP) for Evaluation of PFAA Release from Articles of Commerce (AOCs) — Phase II: Market Monitoring of PFAA Content in New AOCs and Evaluation of Carpet-Care Liquids and Cleaning Methods* and approved SOPs, including the MOPs described in Task 1.

The contractor shall adhere to the QA requirements as delineated in Attachment #1 to the Statement of Work. Work shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

IV. Acceptance Criteria and Management Controls

The Contractor shall either submit to the WAM a project status report every two weeks or, alternatively, report the status orally at the bi-weekly team meeting.

The Contractor shall alert the WAM in advance when it expects a substantial delay in completing the task or submitting the deliverable.

V. Deliverables

1. MOPs for determination of perfluorotelomer alcohols in AOC samples, due May 15, 2012.
2. The Contractor shall create and maintain all sample records by using computer program STRACK-II located in the scientific data share \NRMRL_Guo2. The complete sample records for this performance period are due by the end of this performance period.
3. The Contractor shall submit the Test Summary Data Sheets (in Microsoft Excel) within two weeks after a test is completed. Before submitting the data, the Contractor shall conduct a preliminary data quality review. Each data file shall include the signature of the reviewer and review date.

VI. Personnel

It is recommended that this Work Assignment be lead by a scientist or engineer with experience in product testing. A analytical chemist who is familiar with GC/MS and LC/MS/MS is required.

VII. Work Assignment Manager Designation

The Work Assignment Manager is:

Dr. Zhishi Guo
U.S. Environmental Protection Agency
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division
Indoor Environment Management Branch
Mail Code E305-03
Research Triangle Park, NC 27711
Telephone:919-541-0185
Fax: 919-541-2157
E-mail: guo.zhishi@epamail.epa.gov

The Alternate WA COR is:

Dr. Xiaoyu Liu
U.S. Environmental Protection Agency
National Risk Management Research Laboratory
Air Pollution Prevention and Control Division
Indoor Environment Management Branch
Mail Code E305-03
Research Triangle Park, NC 27711
Telephone:919-541-2459
Fax: 919-541-2157
E-mail: liu.xiaoyu@epamail.epa.gov

VIII. Work Assignment Duration

The period of performance for this work assignment is from the date this work assignment is issued through March 31, 2013.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
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TO BE SUBMITTED POST-AWARD (mark all that apply):

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□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

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□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

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2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

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3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
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3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

ATTACHMENT #1 TO STATEMENT OF WORK FOR QA CATEGORY II PROJECTS

NRMRL QA Requirements and Definitions

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The QAPP shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

Definitions:

Environmental Data - These are any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, that are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization=s/program=s quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization=s/program=s QMP shall address all elements listed in the ARequirements for Quality Management Plans@ in Appendix B of the NRMRL QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

EPA=s Quality System Website: http://www.epa.gov/quality/

EPA=s Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

□ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

Category Level Designations (determines the level of QA required):

□ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in R-5.

X **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in R-5.

□ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of R-5, as outlined in the NRMRL QAPP requirements for the specific project type.

□ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of R-5, as outlined in the NRMRL QAPP requirements for the specific project type.

Suggested Content for Required Elements of QA Project Plans as per R-5:

GROUP A PROJECT MANAGEMENT

There are nine elements in this group. These address project administrative functions and project concerns, goal(s), and approach(es) to be followed.

Element A1- Title and Approval Sheet

- Project title
- Organization name
- Names, titles, signatures, and signature dates of the approving officials

Element A2- Table of Contents

- Table of Contents;
- List of Figures, Tables, References and Appendices
- Document control format

Element A3- Distribution List

Names of individuals and organization(s) to receive a copy of the approved QA Project Plan

Element A4- Project/Task Organization

- List of individuals and organizations involved with the project, identifying their roles and responsibilities
- Documentation of project QA Manager's independence
- Identification of the individual responsible for maintaining the official, approved QA Project Plan
- Organizational chart showing relationships and lines of communication among project personnel

Element A5- Problem Definition/Background

- Statement of specific problem to be solved, decision to be made, or outcome to be achieved
- Background information

Element A6- Project/Task Description

- Summary of work to be performed and products
- Project schedule
- Maps, tables, etc. showing geographic locations

Element A7- Quality Objectives and Criteria

- Outputs from the systematic planning process (e.g., DQOs) used to design the study
- Measurement performance or acceptance criteria established as part of the study design. These relate the quality of data needed to the established limits on the chance of making a decision error or of incorrectly answering a study question

Element A8- Special Training/Certifications

- Description of how the most current approved QA Project Plan will be distributed to project staff
- List of records to be included in the data report package
- List of any other project documents to be produced
- Information on the final disposition of records and documents, including location and retention schedule

Element A9- Documentation and Records

- Any specialized training or certifications needed by personnel
- Plans for providing, documenting, and assuring this training

GROUP B: DATA GENERATION AND ACQUISITION

The ten elements in this group address data generation and data acquisition and management activities.

Element B1- Sampling Process Design (Experimental Design)

Description of project's experimental design

Element B2- Sampling Methods

- Description of sample/data collection procedures
- List of equipment needed
- Identification of performance requirements
- Description of corrective actions to be taken if problems arise

Element B3- Sample Handling and Custody

Description of sample handling requirements and transfer, and for ultimate disposal

Element B4- Analytical Methods

- Description of analytical methods to be used
- Identification of any performance criteria
- Description of corrective actions when problems arise

Element B5- Quality Control

- List of QC activities needed for sampling, analytical, or measurement techniques, along with their frequency
- Description of control limits for each QC activity and corrective actions when these are exceeded
- Identification of any applicable statistics to be used

Element B6- Instrument/Equipment Testing, Inspection, and Maintenance

- List of equipment and/or systems needing periodic maintenance, testing, or inspection, and the schedule for such
- Description of how inspections and periodic preventive maintenance procedures will be performed and documented
- Discussion on how critical spare parts will be supplied and stocked
- Description of how re-inspections will be performed and effectiveness of corrective actions determined and documented

Element B7- Instrument/Equipment Calibration and Frequency

- List of all project tools, gauges, instruments, and other sampling, measuring, and test equipment which should be calibrated
- Description of calibration method and identification of any certified equipment and/or standards to be used
- Details of how calibration records will be maintained and traceable to the instrument/ equipment

Element B8- Inspection/Acceptance of Supplies and Consumables

- A list of project supplies and consumables that may directly or indirectly affect the quality of the results
- The acceptance criteria for them
- Identification of those responsible

Element B9- Non-direct Measurements

- Identification of any existing data that will be obtained from non-measurement sources, such as literature files and historical databases
- Description of how you intend to use the data
- Your acceptance criteria and any limitations for using such data

Element B10- Data Management

- Description of the project data management process
- Description of or reference to the office's standard record-keeping procedures and document control, data storage, retrieval, and security systems
- Identification of data handling equipment and procedures to process, compile, and analyze project

data
- Discussion of data handling procedures to detect and correct errors and loss during data processing
- Examples of any forms or checklists to be used
- Identification of any specific computer hardware/software performance requirements and how configuration acceptability will be determined
- Description of how applicable information resource management requirements will be satisfied, as well as any applicable Agency information resource management requirements (EPA Directive 2100, EPA QA Project Plans only)

GROUP C: ASSESSMENT AND OVERSIGHT

Assessments or evaluations are designed to determine whether the QA Project Plan is being implemented as approved (conformance/nonconformance), to increase confidence in the information obtained, and ultimately to determine whether the information may be used for their intended purpose. The two elements in this group detail what assessments or evaluations will occur both during and after the project. Data assessments, such as data verification and validation, are discussed in the Group D elements.

Element C1- Assessments and Response Actions

- Description of project assessments planned and a brief discussion of the information expected
- Approximate schedule for these assessments and their reports
- For any planned self-assessments, identification of potential participants and their relationship within the project organization
- For independent assessments, identification of the organization and person(s) that will conduct the assessments
- Identification of how, when, and to whom the results of each assessment will be reported and corrective actions implemented

Element C2- Reports to Management

- Frequency and distribution of reports to inform management (EPA or otherwise) of the project's status
- Identification of report preparer and recipients, as well as any specific actions or recommendations recipients are expected to make

GROUP D: DATA VALIDATION AND USABILITY

The three elements in this group address the final project checks to see if the data or product obtained will conform to the project's objectives, and to estimate the effect of any deviations. For projects that use existing data, these elements focus on evaluating how data values from these acquired data sets will be used to determine the quality objectives for the new data use. For a modeling project, this process is similar to confirming that the steps in the modeling process were followed correctly to produce the model outputs and that the results meet project objectives.

Element D1- Data Review, Verification, and Validation

State the criteria for deciding to accept, reject, or qualify project data in an objective and consistent manner

Element D2- Verification and Validation Methods

- Description of how project data will be verified and validated
- Discussion of how any issues will be resolved and identification of who has the authority for resolving them
- Description of how results will be conveyed to data users
- Explanation of how validation issues differ from verification issues for this project

- Examples of any forms or checklists to be used and identification of any project-specific calculations

Element D3- Reconciliation with User Requirements

- Description of how project results will be reconciled with the requirements defined by the data user or decision maker
- An outline of methods proposed to analyze the data and determine possible anomalies or departures from assumptions made when the project was planned
- Description of how reconciliation with user requirements will be documented, issues will be resolved, and how limitations on the use of the data will be reported to decision makers

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-18

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	PFOA Article Testing

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$119,644.00	
Total:	$119,644.00	

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 04/20/2012	$119,644.00	1,474
Cumulative Approved:	$119,644.00	1,474

Work Assignment Manager Name: Znishi Guo (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-0185 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 6/4/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-19

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	NHEERL Metrology QA Laboratory

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
NHEERL Metrology QA Laboratory Support
Continuation of WA 2-19
The contractor shall not begin work until 4/1/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Scott Moore (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-5104 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/13/12 (Date)		Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

SOW FY 2012-2013
Period of Performance: 04/01/2012 – 03/31/2013
Work Assignment Manager (WAM): Scott A. Moore
Work Assignment Title: NHEERL Metrology QA Laboratory Support
Contract Number: EP-C-09-027
Work Assignment Number: 3-19

Introduction

Good Quality Assurance (QA) practice requires that routine operations in a research facility be conducted according to prescribed procedures and that data be of known and adequate quality. To insure good QA it is necessary that instrumentation be maintained in good working condition and that it be checked regularly to assure that it produces reliable data. The National Health and Environmental Effects Research Laboratory (NHEERL) require that QA practices be established and applied to all research measurement efforts. The Metrology Laboratory (MetLab) provides QA assistance to NHEERL researchers by providing the procedures and the standards to calibrate various scientific devices.

I. Goal/Purpose

The objective of this Work Assignment (WA) is to provide support to the MetLab. This is a facility with the capabilities to check (or audit) the calibration of Environmental Protection Agency (EPA) measurement instrumentation. A second objective is to provide support for preparing and verifying Performance Evaluation Audit (PEA) samples. The overall goal is to assure and document that operations performed in EPA facilities produce data will be of a known and adequate quality. This work assignment does not pertain to the calibration of facility devices such as smoke detectors, lights, or any health and safety related devices such as ambient Carbon Monoxide (CO) monitors that alarm strictly for safety reasons because these are not used to produce data for EPA research products.

II. Background Information

Data Uses — Primary users of the products of this WA will be researchers and operators of equipment in EPA/NHEERL facilities. Calibration and PEA results can be reported in research reports to support or verify findings.

Lab Site — Work area is D360-A, D362, and D364-A in EPA's Research Center in Research Triangle Park, NC.

Experience — Personnel assigned to this WA must be capable of performing the tasks listed in Section III (Tasks), which include electrical work, plumbing, general experience with lab equipment and materials, a familiarity with the calibration of measurement devices, and a fundamental understanding of the principals behind the measurements and

the ability to reduce data and report it according to the International Organization for Standardization ISO 17025 "General Requirements for the Competence of Calibration and Testing Laboratories" (ISO 17025) standard and the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM).

III. Tasks: Metrology Quality Assurance Laboratory Support for NHEERL

Task 1 Lab Equipment and Supplies

(1) The Contractor shall obtain performance specifications on potential calibration equipment. The Contractor shall maintain and upgrade calibration systems and equipment as needed. Final decisions regarding upgrading and replacing equipment will be relayed to the Contractor in written technical directive through the WAM.

(2) The Contractor shall maintain MetLab equipment in proper working order. The Contractor shall identify calibration needs and ensure that the necessary factory equipment calibrations for the MetLab equipment are kept up to date. The Contractor shall maintain a record of all maintenance activities. Whenever practically possible the calibration data for this equipment shall include National Institute of Standards and Technology (NIST) traceable information.

Task 2. MetLab Operations

(1) The Contractor shall implement a "Work Request Form" to conform to ISO 17025 and the GUM requirements. The Contractor shall insure that the information is correct for the Division, Branch, Office location, Name and Phone number for each requestor. The Contractor shall retain a copy of each request via hard copy or digital copy.

(2) The Contractor shall perform measurement device and equipment calibrations that conform to ISO 17025 and the GUM. The Contractor shall respond to calibration needs by giving priority to projects that have time constraints. If calibrations cannot be delivered on time because multiple projects have overloaded the ability of the laboratory, the WAM shall be notified and then provide written technical direction to the contractor for prioritization. The Contractor shall maintain a record and data base of all equipment calibrations and calibration schedules.

(3) The Contractor shall develop, document, and implement detailed calibration operating procedures for all laboratory calibration services.

(4) The Contractor shall assemble and maintain a system of published procedures and product information relevant to calibration measurement procedures and measurement devices.

Task 3. Validation of Procedures and Calibration Tracking System

The Contractor shall confirm the current acceptable validation methods for all calibration systems used in the MetLab and also for the calibration tracking system. Any confirmation of validation methods should be documented. All database functions that are user-programmed shall be tested and the validation documented. Each revision to the database software (exclusive of the data in the database) shall have an identifiable revision number assigned to it.

Task 4. Metrology Quality Assurance Laboratory Support for NHEERL Ambient Air Standards Certification

The Contractor shall perform measurement device and equipment calibrations that conform to the NHEERL Calibration SOPs or ISO 17025 and the GUM. Some of these devices will be carried to the MetLab for calibration. Other devices can not be physically carried to the MetLab facility, therefore the Contractor will need to take portable calibration equipment to the NHEERL Lab to perform the calibration. The Contractor shall maintain a record and data base of all equipment calibrations and calibration schedules. The following devices from NHEERL will be calibrated by the Metrology Lab:

a) 30 temperature sensors
b) 30 relative humidity sensors
c) 7 gaseous analyzers (NOx, SO2, HC, CO)
d) 3 PM2.5 samplers (PG200, Met Ones, VAPS)
e) 274 balances
f) 8 micro balances
g) 79 pH meters
h) 25 spectrophotometers
i) 7 fluorometers
j) 18 optical plate readers
k) 43 relative humidity sensors
l) CO 1 Carbon Monoxide Monitor
m) 25 mass flow controllers
n) 1 Hyedro Carbon Analyzer
o) 1 NOX Analyzer
p) 4 PM 2.5 samplers (PG200, Met Ones, VAPS)
q) 1 SO2 Analyzer
r) 42 temperature sensors
s) 1 weather station
t) 3,000 pipettes

IV. Deliverables (Applies to all Tasks)

The Contractor shall provide the following reports for NHEERL:

(1) Monthly reports of the laboratory support activities including the following:
   a) The number of and type of calibrations performed.
   b) Any costs incurred during calibration activities.
   c) Any maintenance activities performed.
   d) Any documentation activities performed.

(2) Special reports as requested via a Written Technical Directive by the WAM.

(3) The Contractor shall respond to calibration needs by giving priority to projects that have time constraints. If calibrations cannot be delivered on time because multiple projects have overloaded the ability of the laboratory, the WAM shall be notified and then provide technical direction to the contractor for prioritization.

(4) The WAM shall be copied on all correspondence to and from any laboratories and vendors used in the completion of the tasks associated with the projects. Any documents or literature during any of these correspondences will also be made available to the WAM.

(5) The contractor shall provide a Calibration Certificate for each device and give it to the Principle Investigator (PI) or to the Contractor Task Lead and keep a copy (either hard copy or electronic) on record.

(6) Formatting of reports should be comparable to historical reporting (using the same or very similar format used during the previous year) and electronic files should be compatible with Agency Standard Software, such as MS Excel 2003, MS Word 2003 and Adobe Reader 9.0 or current agency standard software. Any data recorded by the Ozone instrument (i.e. ozone, temperature, pressure, UV intensity) are automatically entered into a formatted spreadsheet and it automatically calculates the statistical variance of each data set. To make changes to this format, without an intimate knowledge of how the NIST SRP Software uses it, would prevent the instrument from working. Therefore, the same format should be used every time a calibration is performed. Hard copies of reports are acceptable; however, electronic copies are encouraged.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-19

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	NHEERL Metrology Lab Support

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$210,744.00	
Total:	$210,744.00	

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 04/20/2012	$210,744.00	2,856
Cumulative Approved:	$210,744.00	2,856

Work Assignment Manager Name: Scott Moore (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-5104 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	5/14/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-20

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fate and Transport of RRD

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Task 2 has been revised to include wash down tests

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Sangdon Lee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-4531 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	9/12/12 (Date)	Branch/Mail Code: C PAD Phone Number: 513-487-2094 FAX Number: 513-487-2109

Work Assignment Form. (WebForms v1.0)

Statement of Work for Fate and Transport of Radiological Dispersal Device (RDD) (WA 3-20)

The purpose of this work assignment is to support research on radiological dirty bomb particles and building surface materials. A radiological dispersal device (RDD) is the combination of a conventional explosive device and radioactive materials which can be obtained from industrial, commercial, medical and research sectors. Possible radioactive materials include Cs, Sr, Co, Am, I, and U isotopes in various forms such as pure metals, oxides, or salts etc. RDD events may impact society in various ways including: the onset of casualties, disruption of the economy, and denial of use of the contaminated area. Targeted areas are likely to be the highly populated locations, maximizing the disruption of social and economic activities. Therefore, rapid and efficient post clean-up procedures are needed to minimize social and economic damage and prevent adverse human health effects. To develop fast and cost effective decontamination techniques, it is necessary to understand the physicochemical properties of radioactive materials and surfaces including their interactions. Results of this study will support RDD decontamination technology and strategy development by understanding RDD material behavior on building exterior surface materials under various environmental conditions. For this work, particles containing non-radioactive $SrCl_2$ and $CoCl_2$ shall be utilized to investigate the behavior of Sr and Co ions on concrete, limestone, marble, granite and brick under various relative humidity and atmospheric precipitation conditions.

The primary work of this work assignment will be to support the sample preparation and measurement of fundamental sample characteristics. The work assignment involves the following tasks:

Task (1) The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall follow the QAPP prepared by EPA.

Task (2) The contractor shall prepare the substrate coupons using contamination solution of Sr and Co as required under individual tasks. Substrate coupons are common urban nonporous surface materials such as glass, painted steel, galvanized steel, roof material, and sidings The contractor shall evaluate the prepared coupons for Sr and Co contamination in response to the specific test methods as required under individual tasks. **The contractor shall conduct the wash down tests as a function of deposition type (methanol and water based solutions), relative conditions (33 and 86 %RH), and exposure duration (1, 7, and 28 days).**

Task (3) The contractor shall maintain the experimental systems in response to the specific conditions as required under individual tasks. Experimental systems include: relative humidity chamber, water wash down chamber, simulated firehose system, thermo-hygrometer, substrate material, water pump, aerosol deposition apparatus, etc. The contractor shall perform the periodic measurements for the basic data including

relative humidity, temperature, coupon weight, coupon dimensions, and other necessary measurements.

Task (4) The contractor shall conduct the wash down test using a simulated firehose system according to the method described in QAPP, Penetration of Radiological Dispersal Device (RDD) Material on Urban Building Surfaces: Effects of Serial Water Washdown, amendment #2. The contractor shall analyze the concentration of Co and Sr in washdown rinsates using ICP-MS according to the method described in the Quality Assurance Project Plan and report the Co and Sr levels to EPA PI in electronic format.

Task (5) The contractor shall provide various special machinery works as required under individual tasks. The machinery works shall include substrate sample slicing, concrete mold modification, polisher modification, etc.

Project Deliverables for Fate and Transport of RDD:

Deliverables	Date of Completion
Test coupon preparation and data for their dimensions and weights in spreadsheet	**October 30, 2012**
Co and Sr ion concentrations from water washdown samples	**March 31, 2013**
Periodic RH and temperature data in spreadsheet	**December 30, 2012**
Technical support for RDD particle chemistry	**March 31, 2013**

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Fate and Transport of RDD	
Description:	Characterization of Cobalt and Strontium Fate from Radiological Dispersal Devices	
Project ID:	C.2.1.1.1	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Existing QAPP	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-c-09-027
	Work Assignment Number:	20
	Delivery/Task Order Number:	n/a
	Modification Number:	n/a
	Other:	n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Penetration of Radiological Dispersal Device (RDD) Material (CsCl and CoCl2) on Urban Building

Surfaces: Effects of Serial Water Washdown, amendment #0 and #2, 2/23/2011

Does the QAPP require *any* revision by the contractor**

yes

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles.* ?

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

3/5/2012 Ramona Sherman MAR 5 2012

Sangdon Lee NHSRC-DCMD Technical Lead Person	03/05/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	03/05/2012 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions These studies are often pilot-

or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to *all* the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified

2.2 All QA Managers and their relationship in the organizations(*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identifiedmeaning that organizations responsible for planning coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described

4.3 Any site preparation needed prior to sampling/monitoring shall be described

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described

4.13 Holding time requirements shall be noted

4.14 Procedures for packing and shipping samples shall be described

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained

4.16 Sample archival requirements for each relevant organization shall be provided

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided

7.6 The product document that will be prepared for the project shall be specified(*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed

8.3 The responsible party(-ies) for implementing corrective actions shall be identified

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☑ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☑ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI. January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality

assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-20

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fate and Transport of RDD

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW: 2

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
No costs shall be incurred prior to 04-01-12

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Sangdon Lee (Signature) (Date)	Branch/Mail Code:	
	Phone Number	919-541-4531
	FAX Number:	
Project Officer Name Diane Pierce (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-2708
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name Renita Tyus Renita Tyus (Signature) 3/20/12 (Date)	Branch/Mail Code:	CPOB
	Phone Number:	513-487-2094
	FAX Number:	513-487-2109

Statement of Work for Fate and Transport of Radiological Dispersal Device (RDD) (WA 3-20)

The purpose of this work assignment is to support research on radiological dirty bomb particles and building surface materials. A radiological dispersal device (RDD) is the combination of a conventional explosive device and radioactive materials which can be obtained from industrial, commercial, medical and research sectors. Possible radioactive materials include Cs, Sr, Co, Am, I, and U isotopes in various forms such as pure metals, oxides, or salts etc. RDD events may impact society in various ways including: the onset of casualties, disruption of the economy, and denial of use of the contaminated area. Targeted areas are likely to be the highly populated locations, maximizing the disruption of social and economic activities. Therefore, rapid and efficient post clean-up procedures are needed to minimize social and economic damage and prevent adverse human health effects. To develop fast and cost effective decontamination techniques, it is necessary to understand the physicochemical properties of radioactive materials and surfaces including their interactions. Results of this study will support RDD decontamination technology and strategy development by understanding RDD material behavior on building exterior surface materials under various environmental conditions. For this work, particles containing non-radioactive CsCl and $CoCl_2$ shall be utilized to investigate the behavior of Cs and Co ions on concrete, limestone, marble, granite and brick under various relative humidity and atmospheric precipitation conditions.

The primary work of this work assignment will be to support the sample preparation and measurement of fundamental sample characteristics. The work assignment involves the following tasks:

Task (1) The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall follow the QAPP prepared by EPA.

Task (2) The contractor shall prepare the substrate coupons using contamination solution of Cs and Co as required under individual tasks. Substrate coupons are common urban surface materials such as glass, painted steel, galvanized steel, roof material, sidings, concrete, limestone, brick, granite, asphalt, etc. Substrate coupon preparation includes concrete mixture at various water, cement, and aggregate ratios, and substrate sample surface polishing. The contractor shall evaluate the prepared coupons for Cs, Sr, and Co contamination in response to the specific test methods as required under individual tasks.

Task (3) The contractor shall maintain the experimental systems in response to the specific conditions as required under individual tasks. Experimental systems include: relative humidity chamber, water wash down chamber, simulated firehose system, thermo-hygrometer, substrate material, water pump, aerosol deposition apparatus, etc. The contractor shall perform the periodic measurements for the basic data including relative humidity, temperature, coupon weight, coupon dimensions, and other necessary measurements.

Task (4) The contractor shall conduct the wash down test using a simulated firehose system according to the method described in QAPP, Penetration of Radiological Dispersal Device (RDD) Material on Urban Building Surfaces: Effects of Serial Water Washdown, amendment #2. The contractor shall analyze the concentration of Co and Sr in washdown rinsates using ICP-MS according to the method described in the Quality Assurance Project Plan and report the Co and Sr levels to EPA PI in electronic format.

Task (5) The contractor shall provide various special machinery works as required under individual tasks. The machinery works shall include substrate sample slicing, concrete mold modification, polisher modification, etc.

Project Deliverables for Fate and Transport of RDD:

Deliverables	Date of Completion
Test coupon preparation and data for their dimensions and weights in spreadsheet	June 30, 2012
Co and Sr ion concentrations from water washdown samples	March 31, 2013
Periodic RH and temperature data in spreadsheet	September 30, 2012
Technical support for RDD particle chemistry	March 31, 2013

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Fate and Transport of RDD	
Description:	Characterization of Cobalt and Strontium Fate from Radiological Dispersal Devices	
Project ID:	C.2.1.1.1	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Existing QAPP	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-c-09-027
	Work Assignment Number:	20
	Delivery/Task Order Number:	n/a
	Modification Number:	n/a
	Other:	n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

Penetration of Radiological Dispersal Device (RDD) Material (CsCl and CoCl2) on Urban Building

Surfaces: Effects of Serial Water Washdown, amendment #0 and #2, 2/23/2011

Does the QAPP require *any* revision by the contractor**

yes

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles.* ?

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

3/5/2012 Ramona Sherman MAR 5 2012

Sangdon Lee NHSRC-DCMD Technical Lead Person	03/05/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	03/05/2012 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions These studies are often pilot-

or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or nonprimary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified

2.2 All QA Managers and their relationship in the organizations(*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identifiedmeaning that organizations responsible for planning coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained

4.16 Sample archival requirements for each relevant organization shall be provided

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided

7.6 The product document that will be prepared for the project shall be specified(*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed

8.3 The responsible party(-ies) for implementing corrective actions shall be identified

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. **All Quality documentation shall be submitted to the Government for review. The Government will review and return the** quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☑ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the NHSRC's QMP: QAPP requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☑ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI. January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality

assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-20

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Fate and Transport of RDD

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period	Cost/Fee	LOE
This Action:	04/01/2009 To 03/31/2013	$0.00	
		$95,035.00	
Total:		$95,035.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	04/20/2012	Cost/Fee: $95,035.00	LOE: 1,088
Cumulative Approved:		Cost/Fee: $95,035.00	LOE: 1,088

Work Assignment Manager Name: Sangdon Lee (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-4531	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2708	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/16/12 (Date)	Branch/Mail Code: cpad	
	Phone Number: 513-487-2094	
	FAX Number: 513-487-2109	

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-21

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	MODIFICATION AND TESTING OF TR

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	Section 2

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Full title: MODIFICATION AND TESTING OF TRANSPORTABLE GASIFIER FOR ANIMAL CARCASSES

Contractor shall not begin work prior to 04-01-12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Shannon Serre (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-3817
	FAX Number:	
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-2708
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 3/19/12 (Date)	Branch/Mail Code:	CPOD
	Phone Number:	513-487-2094
	FAX Number:	513-487-2109

STATEMENT OF WORK

MODIFICATION AND TESTING OF TRANSPORTABLE GASIFIER FOR ANIMAL CARCASSES

OMIS DCMD C.4.1.1.3
(APPCD ON-SITE CONTRACT EP-C-09-027)
WA 3-21

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TABLE OF CONTENTS

I. TITLE

Modification and Testing of Transportable Gasifier for Animal Carcasses

II. PERIOD OF PERFORMANCE

The period of performance for the work under this work assignment shall be Award – 3/31/13.

III. SUMMARY OF OBJECTIVES

The objective of this work assignment is to make repairs and modifications to the gasification system, and to run an appropriate Proof of Concept test on swine and poultry in a real world environment.

IV. RELEVANCE

A comprehensive response strategy is required to effectively mitigate animal health emergencies (i.e. high –consequence foreign animal diseases) and maintain continuity of business to the maximum extent practicable. This response strategy must incorporate plans and technologies for rapid depopulation, decontamination, and disposal of affected animals. This technology could be used as a disposal option for animal carcasses following a disease outbreak.

V. BACKGROUND

This project is a combined effort between the Environmental Protection Agency (EPA) and the Department of Homeland Security (DHS). EPA and DHS are committed to using cutting edge technologies and scientific talent in our quest to make America safer.

A comprehensive response strategy is required to effectively mitigate animal health emergencies (i.e. high –consequence foreign animal diseases) and maintain continuity of business to the maximum extent practicable. This response strategy must incorporate plans and technologies for rapid depopulation, decontamination, and disposal of affected animals. Current response strategies which rely on stop-movement orders, quarantine, depopulation, carcass disposal, and limited application of available vaccines, are inadequate to meet the logistical challenges of large and/or multifocal outbreaks. Furthermore, these response efforts fail to manage or mitigate the psychological, social, economic, trade, social, or environmental consequences. There is a critical need to develop new and/or enhanced animal health emergency response strategies, tools, and technologies in order to increase capacity and to ensure that depopulation, decontamination, and disposal (3D) activities are handled as rapidly and as humanely as possible.

During the past five years, an interagency team, including USDA, the EPA, the Department of Defense (DoD), and the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) has been collaborating on a project managed by the DoD's Technical Support Working Group (TSWG), involving the poultry and swine industries, to develop a technology to dispose of animal carcasses resulting from disease or natural disaster by mobile maceration and thermal gasification.

Early tests showed promise in a prototype equipment package designed and constructed to process 25 tons or more of swine or poultry carcasses in a day, with the system being expandable with multiple units to process up to 200 tons or more of carcasses daily. Initial field testing of the prototype indicated that many of the design requirements were successfully met and tested, but some design flaws in the prototype created limitations in achieving the desired feed rate.

This Scope of Work describes an effort to make needed repairs and modifications to the system, and to run an appropriate Proof of Concept test on swine and poultry in a real world environment. Such technology would provide the basis for strategically placed gasifier units around the country that could respond to diseases or disaster in a timely manner and provide an environmentally sound carcass disposal option.

With repair, enhancement, modification of the prototype system and effective training of an operating staff, the macerator and gasifier system should be able to safely process 25 tons or more of poultry or swine carcasses per day. The current prototype does not have the capability of processing large animal carcasses such as bovine or equine due to cost savings achieved on the macerator purchase that is with

the unit. The addition of a pre-breaker would enable large animals to be processed. Another important note is that the macerator unit is on a self-contained trailer and could be used in conjunction with other large-scale technologies that DHS might be interested in developing and testing.

The prototype is currently located at an agricultural industry site in North Carolina. Although some of the components (e.g., generator) have received routine maintenance, there has been some deterioration of some components due to the unit having not been operated for an extended period of time.

VI. SCOPE

The existing gasifier prototype shall be repaired to restore the components that are not being replaced in the activities of other tasks to their functional state. This shall include repair of the outer shell, refractory, ash discharge auger, trailers, control system, door assemblies, electrical components, generator, macerator, and feed system. All repairs shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

VII. TECHNICAL APPROACH

This is a follow on work assignment from the previous option period. A plan has been developed on how to proceed with the modification of the gasifier system. A list of suggested repairs shall be submitted by the contractor to the EPA WAM for consideration prior to initiating any repairs. Written authorization will be provided by WAM on repairs that shall be completed. Once the repairs have been completed a series of shakedown tests shall be planned based on discussions between the EPA WAM and the contractor.

VIII. AFFORDABILITY

This effort is labor intensive, which is where the bulk of the funding is required. The contractor shall determine which materials are necessary to repair the gasifier. Large capital equipment items will be procured by the EPA with smaller items being procured by the contractor. The unit is currently located in Rose Hill, NC and moving the unit is not financially feasible, so it may be necessary to subcontract with someone in the Rose Hill area to assist in repair/upgrade of the unit.

IX. TECHNICAL RISK

The technical risk involved in this project is minimal. The ultimate goal is to test the throughput operation of the gasifier using swine and poultry.

X. FACILITIES AND MATERIALS

All experimental efforts shall be performed by the contractor at the current location of the gasifier which is Rose Hill, NC. If deemed feasible, the gasifier unit may be moved to Research Triangle Park, NC for repairs if contractor and WAM decide this is the most feasible way to repair the unit.

XI. TASKS

The following tasks are defined as part of this work assignment:

Task 1: Repair the damaged and deteriorated components of the gasifier prototype

The existing prototype shall be repaired to restore the components that are not being replaced in the activities of other tasks to their functional state. This shall include repair of the outer shell, refractory, ash discharge auger, trailers, control system, door assemblies, electrical components, generator, macerator, and feed system. All repairs shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

Task 2: Replace the oil-fired burners and associated equipment with gas-fired burners

The initial design decision to use oil-fired burners, although noble in its intent of minimizing logistics associated with fuel delivery by having the generator and burners use the same fuel, resulted in significant operational difficulties, including difficulty igniting, poor turndown ratios, and unreliable operation. The unit will be refitted with gas burners that burn LP or natural gas, and associated piping, fuel delivery, flame safety, and process control hardware. All new equipment installations will be

documented using Computer Aided Design (CAD) tools and all revised design drawings will be collected into a system documentation manual in both electronic and hard copy form.

Task 3: Modification of the feed system

The initial feed system design required manual actuation of the feeding valves from the top of the gasifier to distribute the feed onto the gasifier's hearth. The initial feed system also had a side effect that a volume of material equal to the amount of material fed into the macerator was introduced onto the hearths. This required paying significant attention to the introduction of material into the macerator, and caused operational difficulties when large animals were fed into the macerator. The feeding system shall be redesigned to decouple the quantity of material fed into the macerator from the quantity of material distributed onto the gasifier's hearth. In addition, the material transport system shall be re-evaluated to potentially use an auger rather than a pump. In addition, the control of the valves to distribute the feed across the gasifier hearths shall be automated with a manual override at ground level. The feed system shall be able to operate under negative draft to reduce the potential of contamination via aerosols escaping the system. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

Task 4: Develop training materials for operational personnel

Training materials shall be developed for operational personnel to encompass mobilization, field assembly, operation, cleaning, maintenance, repairs, troubleshooting, and demobilization. Training materials shall be delivered in both hard copy and electronic forms.

Task 5: Evaluate and modify control system for the macerator and gasifier

The electrical system, control system, and associated equipment shall be tested and modified (if necessary) to assure that the gasifier can operate safely from a suitable location in all weather conditions. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

Task 6: Shakedown Testing

Once the modifications and repairs have been completed, the project operating team shall conduct a series of shakedown tests to optimize the performance of the unit, properly adjust the system, train personnel to safely and reliably operate it in the field, and perform at the highest throughput possible. Information shall be used to develop and design operations, maintenance, repair, assembly, disassembly and transportation material for reference and training. A Quality Assurance Project Plan shall be developed and approved, prior to any testing, to address any measurements to be taken as a part of this testing.

Task 7: Maximum Throughput Continuous Operation Test

The contractor shall carry out and document a three-day Proof of Concept (PoC) test at the highest throughput safely possible. It is anticipated that a 72 hour continuous test shall be required as part of this task. Upon completion of the test, the contractor shall clean and disinfect the equipment and test area, and prepare the system for relocation. The contractor shall prepare an After Action Report (AAR) based on the project activity and the results of the test. A Quality Assurance Project Plan shall be developed and approved, prior to testing, to address any measurements to be taken as a part of this testing.

Task 8: Modification of the macerator system

Upgrade of the processing macerator capability for bovine and equine carcasses by the addition or incorporation of a pre-breaker and associated infrastructure and transporting systems shall be required. The contractor shall recommend the required components and shall install these components as part of this task. Depending on budgetary constraints this Task will receive the lowest priority out of all the Tasks for this work assignment. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings will be collected into a system documentation manual in both electronic and hard copy form.

Task 9: Documentation

As part of this task, the contractor shall evaluate and document the system, its operation, required maintenance, performance, and any other modifications or improvements. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form. A complete set of all of this documentation shall be placed with the unit in a weather protected container and provided to the project officer. It is anticipated that a total of 5 sets of documentation shall be provided.

Task 10: Clean, Decontaminate, Disassemble, Secure for Transport

The contractor shall clean, decontaminate, disassemble, and securely package the gasifier system, including macerator, for transport to a location identified by the North Carolina Department of Agriculture and Consumer Services for staging. If the Contractor does not have the capacity to transport the system once it is packaged, a heavy rigging/trucking company shall be hired by the contractor to transport and unload the system at the designated location. The location is anticipated to be in the Raleigh, NC area.

XII. DELIVERABLE SCHEDULE

- On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, quarterly and cumulative financial expenditures and cost and schedule variance.

- A draft report shall be delivered to the EPA WAM within 6 weeks of the conclusion of Task 8.

Deliverable Schedule

Deliverable	Date
QAPP/Test Plan	1 month prior to beginning Task 6
Data summaries	On-going
Draft Report	6 weeks after conclusion of Task 7
Final Report	4 weeks after receiving comments from EPA

XIII. REPORTING REQUIREMENTS

- The Contractor shall prepare Quality Control data reports of all facility-specific data. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.
- The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.
- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Modification and Testing of Transportable Gasifier for Animal Carcasses
Description:	Modification and Testing of Transportable Gasifier for Animal Carcasses
Project ID:	C.4.1.1.3
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	III
Security Classification:	Unclassified
Project Type:	Design/Construction/Operation of Environ. Technology; Basic Research
QAPP Status 1:	Not Delivered
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027 Work Assignment Number: 3-21 Delivery/Task Order Number: NA Modification Number: NA Other: NA

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

Yes — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use

by the contractor? (QA approval must be obtained before the contractor can start work.)

Provide the expected title for submission to QA staff for approval:
Modification and Testing of Transportable Gasifier for Animal Carcasses
Provide the approximate date for submission to QA staff for approval:
07/31/2012

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: The QAPP should be developed in accordance with the attached "Requirements for Developing a Basis Research QAPP as well as the requested Quality System Specification for extramural Actions -- see attachment #1 and #2.
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Shannon Serre 29 Feb 2012		Ramona Sherman FEB 28 2012	
Shannon Serre NHSRC-IO Technical Lead Person	02/28/2012 Date	Ramona Sherman NHSRC-IO QA Staff Member	02/28/2012 Date

QAPP REQUIREMENTS FOR BASIC RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

A basic research project is a study performed to generate data used to evaluate unproven theories, processes, or technologies.

SECTION 1.0, PROJECT OBJECTIVES AND ORGANIZATION

1.1 State the project objectives.

1.2 Identify the responsibilities of all project participants (*e.g.*, QAPP preparation, sample collection and analyses, data reduction/validation/analysis, report preparation, QA).

SECTION 2.0, EXPERIMENTAL APPROACH

2.1 Describe the process, site, facility, apparatus, and/or environmental system to be tested.

2.2 Describe all known or pre-established test conditions and variables, including replicate experimental runs

2.3 Describe the planned approach (statistical and/or non-statistical) for evaluating project objectives (*i.e.*, data analysis).

SECTION 3.0, SAMPLING AND MEASUREMENT APPROACH AND PROCEDURES

3.1 Complete the following table to summarize the sampling strategy to be used

Sample/Measurement Location	Matrix	Measurement	Frequency	Experimental QC1	Total No. Samples

1QC samples generated during experiment, as applicable (*e.g.*, blanks, replicate samples, spikes)

3.2 Complete the following table to summarize the sampling and analytical procedures to be used

Matrix	Measurement	Sampling/ Measurement Method1	Analysis Method1	Sample Container/ Quantity of Sample	Preservation/ Storage	Holding Time(s)2

1Provide details in text, as necessary, if standard method or SOP cannot be referenced
2Both to extraction and analysis, if applicable

SECTION 4.0, QA/QC CHECKS

Complete the following table to summarize QA/QC checks.

Matrix	Measurement	QA/QC Check1	Frequency	Acceptance Criteria	Corrective Action

1Include all QA/QC checks (experimental and analytical, as applicable) for accuracy, precision, detection limits, mass balance, *etc.* (*e.g.*, matrix spikes, lab control samples, blanks, replicates, surrogates)

SECTION 5.0, DATA REPORTING

Describe data reduction procedures specific to the project

SECTION 6.0, REFERENCES

Provide references to methods and germane prior publications.

IN ADDITION, WHEN APPLICABLE ...

- list all project-specific target analytes (*i.e.*, when a class of compounds is specified in the table)
- indicate if reporting is on a wet or dry weight basis (solid matrices only)
- describe the method used to establish steady-state conditions
- describe how sampling equipment is calibrated
- describe how cross-contamination between samples is avoided
- describe the procedures used to collect representative samples
- describe sample packing and shipping procedures
- describe instrument calibration procedures and acceptance criteria if not included in a referenced method or SOP

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☑ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP**

QAPP requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☑ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☑ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5s-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A

QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-21

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	MODIFICATION AND TESTING OF TR

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 03/31/2013	$0.00	
This Action:	$385,970.00	
Total:	$385,970.00	

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 04/20/2012	$385,970.00	3,661
Cumulative Approved:	$385,970.00	3,661

Work Assignment Manager Name: Shannon Serre (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3817 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus (Signature): Renita Tyus (Date): 5/16/12		Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-22

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Raleigh Near-Road Site

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:
Raleigh Near-Road Site Operation
See attached SOW.
The contractor shall not begin work until 4/1/12.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Sue Kimbrough (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2612 FAX Number:
Project Officer Name: Diane Pierce (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus (Signature): Renita Tyus (Date): 3/8/12		Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109

STATEMENT OF WORK

TABLE OF CONTENTS

1 **TITLE:** Raleigh Near-Road Site Operation

2 **DATE:** 04/01/2012

3 BACKGROUND

EPA in collaboration with the Federal Highway Administration (FHWA) has conducted two long-term near-road studies in Las Vegas, NV and Detroit, MI. The Las Vegas study was completed in March, 2010 and the Detroit study was completed in June, 2011. A principal driver behind these studies was a Settlement Agreement between FHWA and Sierra Club to perform near-road air pollution studies.

On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2). To determine compliance with the new standard, EPA established new ambient air monitoring and reporting requirements for NO_2. At least one monitor must be located near a major road in any urban area with a population greater than or equal to 500,000 people. Raleigh, NC is such an urban area. This new NO_2 monitor must begin operating no later than January 1, 2013.

For the study covered by this SOW, EPA will be collaborating with the North Carolina Department of Environment and Natural Resource's (NCDENR) Air Quality Division and FHWA regarding a near-road air pollution study. This collaboration leverages resources of all three agencies with regards to establishing a long-term study site for EPA's near-road research program and interest in air pollution control strategies and exposure assessment, a long-term near road NO_2 monitoring site for NCDENR, and a long-term near-road site for FHWA's interest in identifying effective strategies for mitigating air pollution from transportation sources.

The Raleigh Near-Road site will function as a multi-pollutant measurement research site that will include (but not limited to) NO, NO_2, NOX, CO, BC, mobile source air toxics (MSATs), particulate ($PM_{2.5}$), ultrafine particulate, etc. The objective of the research study is to determine mobile source air pollution concentrations and variations in concentrations as a function of distance from the highway and to establish relationships between mobile source air pollution concentrations as related to highway traffic flows including traffic count, vehicle types

and speeds; and meteorological conditions such as wind speed and wind direction. As such, the Raleigh Near-Road study would be expected to provide data detailing concentrations and distributions of motor vehicle emitted pollutants including regulated gases, air toxics, and particulate matter. Specifically, the data will be used to address the following goals:

1. Identify the existence and extent of elevated air pollutants near roads.
2. Determine how vehicle operations and local meteorology influence near road air quality for regulated and air toxic pollutants.
3. Collect data that will be useful in evaluating and refining, if necessary, models used to determine the emissions and dispersion of motor vehicle related pollutants near roadways.

The following site is currently selected and site infrastructure is currently under development:

1. Raleigh, NC

4 APPLICABLE, CONTROLLING DOCUMENTS AND WEB SITES:

"Monitoring Protocol", Attachment A to this document (previously provided under EP-C-09-027, WA 2-39).

Office of Environmental Information. ***EPA Requirements for Quality Assurance Project Plans***, EPA QA/R-5,EPA/240 /B-01/003, U.S. Environmental Protection Agency. March 2001. http://www.epa.gov/quality/qs-docs/r5-final.pdf.

Office of Environmental Information. ***Guidance for Quality Assurance Project Plans*** (QA/G-5), EPA /240/R-02/009, U.S. Environmental Protection Agency. December 2002, http://www.epa.gov/quality/qs-docs/g5-final.pdf.

Office of Research and Development. ***Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition Compendium Method TO-11A Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC) [Active Sampling Methodology]***. EPA/625/R-96/010b, U.S. Environmental Protection Agency. January 1999, http://www.epa.gov/ttn/amtic/files/ambient/airtox/to-11ar.pdf.

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Martin, Peter T., Feng, Yuqi. Wang, Xiaodong. ***Detector Technology Evaluation***. University of Utah, University of Utah Traffic Lab, November 2003. http://www.mountain-plains.org/pubs/pdf/MPC03-154.pdf

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EPA's Quality System Web Page -- http://www.epa.gov/quality/qa_docs.html

EPA's Air Toxics Methods Web Page -- http://www.epa.gov/ttn/amtic/airtox.html

EPA's List of Designated Reference and Equivalent Methods – http://www.epa.gov/ttn/amtic/files/ambient/criteria/ref0706.pdf

Traffic Detector Technology Evaluation Web Page – http://www.mountain-plains.org/pubs/html/mpc-03-154/index.php

Herrington, J.; Zhang, L.; Whitaker, D.; Sheldon, L.; Zhang, J. Optimizing a dansylhydrazine (DNSH) based method for measuring airborne acrolein and other unsaturated carbonyls. Journal of Environmental Monitoring 7 (10): 969-976, 2005.

Herrington, J. S.; Fan, Z. H.; Lioy, P. J.; Zhang, J. F. Low acetaldehyde collection efficiencies for 24-hour sampling with 2,4-dinitrophenylhydrazine (DNPH)-coated solid sorbents. Environmental Science & Technology 41 (2): 580-585, 2007.

Herrington, J. S.; Zhang, J. J., Development of a method for time-resolved measurement of airborne acrolein. Atmospheric Environment 2008, 42, (10), 2429-2436.

5 TECHNICAL REQUIREMENTS/TASK DESCRIPTION:

The technical basis for this effort will be the "Monitoring Protocol" – Attachment A. The contractor shall perform the Monitoring Protocol as described in Attachment A of this document. The contractor shall propose alternative methods/approaches that may yield cost-savings over the life of the project. These alternative methods/approaches should be construed as encompassing all aspects of the project. This SOW involves the field measurement, data summarization and final report components of the Monitoring Protocol. The laboratory analyses component of the Monitoring Protocol will be conducted under a different contract mechanism.

Before this work is initiated the contractor shall meet with the EPA researchers to ensure that the objectives of this project and the resource boundaries are understood.

WA 3-39

This work assignment (site operation) continues the work started under WA 3-1 (site infrastructure, EP-C-09-027).

5.1 Option 1

5.1.1 Study Site/City Site Selection, Duration, and Preparation

The study site was selected in collaboration with North Carolina DENR Air Quality Division staff. Throughout the rest of this SOW the site will be referenced as the Raleigh Near-Road site or Triple Oak site. A GoogleMaps image of the site is provided as Attachment B.

The terms "location" and "site" shall be interpreted to include the AIRS site as well as the Triple Oak site that will be operated for the duration of this study as required by the specific needs of this project. The approximate start date for the field monitoring is on or about June 15, 2012.

NOTE: Section 5.1.1 as well as sub-sections 5.1.1.1 thru 5.1.1.5 is explicitly covered by Arcadis Contract, EP-C-09-027, Work Assignment 3-39

5.1.1.1 Site Operation Permits

5.1.1.2 Site Electrical Connections

5.1.1.3 Site Communications Connections

5.1.1.4 Site Security

5.1.1.5 Field Deployment

5.1.2 Site Operation

Remote monitoring of instrumentation will be performed by EPA staff at the RTP Facility utilizing a PC running WinAQMS/WinCollect. When instrument performance issues occur, a site operator will be dispatched on an as needed basis and as resources permit.

5.1.2.1 Utility Costs

This section is explicitly covered by Arcadis Contract, EP-C-09-027, WA 3-39.

5.1.2.2 Pollutants of Interest

The contractor shall collect monitoring data for the pollutants of interest as required by the specific needs of this study. The pollutants of interest are as follows:

Pollutant	Sub-Species	Monitoring Method	Frequency	Sampling Period	Samples Sampling Frequency	Samples Year
Sulfur Dioxide		continuous	Continuous	Continuous	Continuous	Continuous
Carbon Dioxide		continuous	Continuous	Continuous	Continuous	Continuous
Ultrafines		continuous	Continuous	Continuous	Continuous	Continuous
Diesel Particulate Matter	Carbon Monoxide	continuous	Continuous	Continuous	Continuous	Continuous
	Nitrogen Oxides	continuous			Continuous	Continuous
	Black Carbon	Aethalometer continuous			Continuous	Continuous
	$PM_{2.5}$	SHARP	Continuous	Continuous	Continuous	Continuous
		integrated	TBD	1 / 24-hour period	TBD	TBD
Acetaldehyde		TO-11A cartridge (DNPH)	TBD	TBD	TBD	TBD
Formaldehyde						
Acrolein		cartridge (DNSH)	TBD	TBD	TBD	TBD
Acrolein		TO-15	TBD	TBD	TBD	
1,3-Butadiene			TBD / continuous	TBD / continuous	TBD / continuous	
Benzene		GC				

NOTE: There is an error in the Monitoring Protocol. The Monitoring Protocol cites the use of Method TO-11A for the sampling and measurement of acrolein. This is incorrect the Monitoring Protocol should be citing Method TO-15. For the purposes of this project we will be collecting acrolein samples (initially) using two different techniques, cartridges and canisters. Cartridge samples will be collected using DNSH coated solid sorbent and canister samples will be collected using the TO-15 method.

The acrolein cartridge samples shall be analyzed in accordance with appropriate laboratory procedures. The laboratory analysis shall be performed under a different contract mechanism to be determined.

The canister samples shall be analyzed in accordance with appropriate laboratory procedures. The laboratory analysis shall be performed under a different contract mechanism to be determined.

5.1.2.3 Data Completeness

This contractor shall collect monitoring data with completeness criteria as shown in the table below and as required by the specific needs of this study. The basis for this table is the Monitoring Protocol – Attachment A.

Pollutant	Sampling Approach	Accuracy	Precision	Data Completeness
Sulfur dioxide	continuous monitoring (pulsed fluorescence)	20%	10%	80%
Carbon dioxide	non-dispersive infrared	20%	10%	80%
Carbon monoxide	Continuous monitoring (NDIR FRM CO analyzer)	20%	10%	80%
Nitrogen oxides	Continuous monitoring (Chemiluminescence NOx analyzer)	20%	10%	80%
Black carbon (surrogate - diesel)	Continuous monitoring (Aethalometer)	5%	5%	80%
$PM_{2.5}$	Continuous monitoring (SHARP)	20%	10%	80%
Ultrafines	Continuous monitoring (TSI)	20%	10%	80%
$PM_{2.5}$	Integrated filter sampling ($PM_{2.5}$ FRM method)	20%	10%	90%
Cartridge Sampling (DNPH)				

Pollutant	Sampling Approach	Accuracy	Precision	Data Completeness
Acetaldehyde (MSAT)	Integrated sampling/HPLC analysis (USEPA Method TO-11A)	10%	5% for flow rate 10% for HPLC	90%
Formaldehyde (MSAT)	Integrated sampling/HPLC analysis (USEPA Method TO-11A)	10%	5% for flow rate 10% for HPLC	90%
Cartridge Sampling (DNPH)				
Acrolein (MSAT)	Integrated sampling/HPLC analysis	10%	5% for flow rate 10% for HPLC	90%
Canister Sampling				
Acrolein (MSAT)	Integrated sampling/GCMS analysis (USEPA Method TO-15)	10%	5% for flow rate 10% for GCMS	90%
Benzene (MSAT)	Canister sampling-GC/MS analysis (USEPA Method TO-15)	10%	5% for flow rate 10% for GC/MS	90%
1,3-Butadiene (MSAT)	Canister sampling-GC/MS analysis (USEPA Method TO-15)	10%	5% for flow rate 10% for GC/MS	90%
Continuous GC				
Benzene (MSAT)	Continuous GC	10%	5%	80%
1,3-Butadiene (MSAT)		10%	5%	80%

5.1.2.4 Sampling Schedule – Integrated Samples

The sampling schedule will be determined at a later date. This element of the work will be initiated in a follow-on contract mechanism.

5.1.2.5 Sampling Schedule Verification

The sampling schedule will be determined at a later date. This element of the work will be initiated in a follow-on contract mechanism.

5.1.2.6 Calibration Gases

This task was previously initiated by Arcadis Contract, EP-C-09-027, Work Assignment 3-35. Other compressed gases may be designated as being required. The contractor shall consult with the EPA WAM, and other EPA technical representatives prior to purchasing/leasing other compressed gases.

5.1.2.7 Maintenance of Equipment

The contractor shall be responsible for the proper maintenance of equipment as required by the needs of this study.

5.1.2.8 Supplies and Other Miscellaneous Equipment

A list of government furnished property (GFP) that shall be used for this project may be found in Attachment D. It is anticipated that this list is reasonably complete at this time. The contractor shall purchase or otherwise have available any additional miscellaneous equipment or supplies that may be needed for successful completion of this effort. The contractor shall consult with the EPA WAM, and other EPA technical representatives prior to purchasing items in excess of $2,000.

The contractor shall lease or purchase as needed the required supplies such as calibration gases, canisters, filters, and other miscellaneous equipment not already specifically identified as required by the needs of this study.

5.1.3 Traffic Monitoring and Vehicle Classification

Traffic data is being collected by NC DOT. In addition, this task will utilize existing traffic sensor equipment to collect traffic data.

5.1.4 Laboratory Analyses (including Chain of Custody)

5.1.4.1 Chain of Custody

This element of the work will be initiated in a follow-on contract mechanism.

5.1.4.2 Laboratory Analyses

The laboratory analysis will be performed in-house by EPA staff.

5.1.4.3 Canister Cleaning and Shipping

This task will be performed in-house by EPA staff.

5.1.5 Data Reduction, Storage and Reporting

The contractor shall be responsible for developing a data reduction, storage and reporting plan as required by the specific needs of this study and in coordination with the EPA WAM, other EPA technical staff and a technical representative from FHWA. This plan shall include details concerning the software, hardware and media that will be used to store, analyze, summarize and report the data. This plan shall be included in the QAPP previously described by this SOW.

5.1.5.1 Statistical Analysis

The contractor shall provide logistical support for the statistical analyses as described in Section 7.2.1 of the Monitoring Protocol. This logistical support shall take the form of (but is not limited to) the preparation of tables, graphs, text, etc. that would be used to create report(s) as required by the needs of this study. The results of statistical analyses or other relevant calculations shall be provided to the EPA WAM in the required QA/QC audit reports, quarterly data reports and a final report as required by the specific needs of this study. The contractor shall consult with the EPA WAM and other EPA technical representatives on the nature of the statistical software prior to implementation.

5.1.6 Quality Assurance Project Plan (QAPP)

The applicable QAPP QTRAK # is 07035-A12395. This is a previously approved QAPP.

This QAPP is a "living document" and as such may require modifications as required by the needs of this study. The contractor shall provide input and revisions to the QAPP as required by the needs of this study. The QAPP that results from this task will be included as an Appendix to the final report.

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form" and the NRMRL QA Requirements/Definitions List included with this effort (Attachment C). The work to be performed falls under the QA requirements for "**Sampling and Analysis**" projects, Category II (See Attachment C for outline of requirements). See ***EPA Requirements for Quality Assurance Project Plans***, EPA QA/R-5, EPA/240/B-01/003, March 2001, http://www.epa.gov/quality/qs-docs/r5-final.pdf. Additional guidance with regards to sampling and analysis QAPP requirements may be found in Chapter 2 of the Guidance for Quality Assurance Project Plans (QA/G-5), EPA /240/R-02/009, December 2002, http://www.epa.gov/quality/qs-docs/g5-final.pdf.

5.1.7 Safety Plan

The contractor shall revise as necessary the Safety Plan previously developed under Contract EP-C-09-027, WA 0-39, WA 1-39, and WA 2-39.

5.1.8 Project Reports

The contractor shall provide monthly reports, QA/QC audit reports, quarterly data reports and a final report as required by the specific needs of this study.. Section 8 of the Monitoring Protocol (Attachment A) contains the relevant details.

6 DEFINITIONS:

Turnkey System -- A complete system, ready to operate. The term derives from the idea that the end user can just turn a key and the system is ready to go. Turnkey systems include all the hardware and software necessary for the particular application. They are usually developed by systems integrators who buy components from another company and then add software and other devices themselves. The implementation of a turnkey system in this context includes all systems, subsystems and components, equipment installation, testing, training, delivery to site of operation and operational support (i.e., maintenance).

Air Monitoring Station -- Air monitoring stations are shelters containing the air sampling instrumentation including the meteorological instrumentation, data logging hardware, software, communications and any other equipment and supplies as required by the specific needs of the *FHWA Detailed Monitoring Protocol*. For this project, air monitoring stations may be standard utility trailers or converted shipping containers.

7 REPORTING REQUIREMENTS

1. This project is covered under a previously approved QAPP (QTRAK # 07035-A12395). This QAPP will be amended by EPA staff to specifically address the RALEIGH field study.
2. The contractor shall schedule monthly conference calls with the EPA WAM during which task progress and issues will be discussed. The contractor shall summarize the notes from each of these conference calls in the form of an e-mail message to the EPA WAM.
3. The contractor shall provide monthly reports, QA/QC audit reports, quarterly data reports and a final report as required by the specific needs of this study. Section 8 of the Monitoring Protocol (Attachment A) contains the relevant details.

DELIVERABLES

1. This project is covered under a previously approved QAPP (QTRAK # 07035-A12395). This QAPP will be amended by EPA staff to specifically address the RALEIGH field study.
2. The EPA WAM will provide written & oral comments to the contractor within 4 weeks of the delivery of the QA/QC plan (Item 1 above).
3. The contractor shall prepare monthly reports, QA/QC audit reports, quarterly data reports and a final report as required by the specific needs of this study. These reports shall be provided to the EPA WAM in an MS Word format (1 electronic & 5 hardcopies).
4. The EPA WAM will provide written and oral comments to the contractor within 7 days and 15 days of the delivery of the monthly report and quarterly data reports, respectively.
5. A final report from this effort will be developed under a future work assignment.
6. The contractor shall deliver to EPA WAM in a suitable electronic form the data collected during this study as well as the summarized data generated by this project. The contractor shall consult with the EPA WAM and other EPA technical representatives on the nature of the software prior that will be used to analyze and summarize the data prior to implementation. The contactor shall deliver to the EPA WAM all software programs, macros, scripts and any other tools that have been developed and used to store, analyze, summarize and report the data.

Summary of Deliverables

Item	Description	Due Date
a	QA/QC Plan	QAPP (QTRAK # 07035-A12395)
b	Email Summaries	2-days after each conference call
c	Monthly Reports	10-days after end of month
d	Quarterly Reports	15-days after end of quarter
e	Final Report	Future work assignment (to be determined)

Summary of Deliverables

Item	Description	Due Date
f	QA/QC Audit Reports	20-days after performance of QA/QC audit

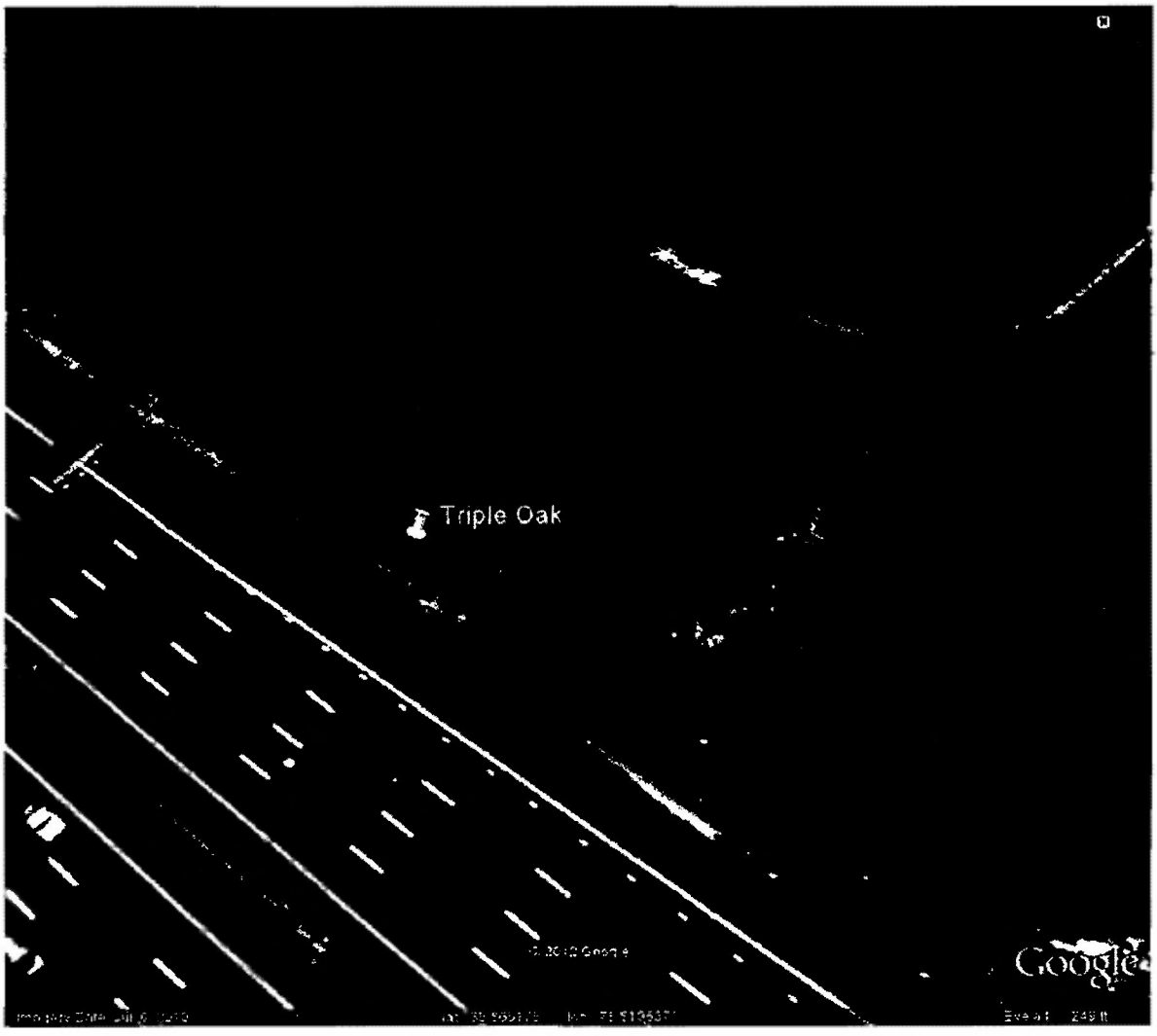
NOTE: When Monthly and Quarterly Reports coincide, the Quarterly Report shall fulfill both the Monthly and Quarterly Report requirements.

8 SPECIAL TERMS AND CONDITIONS

Attachment	Contents
A	Monitoring Protocol (Supplied under WA 2-39, WA 2-22)
B	Site Map (Supplied under WA 3-39)
C	QA Requirements (Supplied under WA 2-39, WA 2-22)
D	Equipment List
E	QAPP (QTRAK # 07035-A12395)

In addition to a detailed analysis of the technical approach that will be used for this project, the contractor shall propose alternative methods/approaches that may yield cost-savings over the life of the project. These alternative methods/approaches should be construed as encompassing all aspects of the project.

ATTACHMENT B – AERIAL VIEW OF TRIPLE OAK SITE



EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-22

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	Raleigh Near-Road Site

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/01/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee:	$0.00	LOE:
This Action:		$15,572.00	
Total:		$15,572.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee:	$15,572.00	LOE: 166
Cumulative Approved:	Cost/Fee:	$15,572.00	LOE: 166

Work Assignment Manager Name: Sue Kimbrough (Signature) (Date)	Branch/Mail Code:	
	Phone Number	919-541-2612
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-2708
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 5/21/12 (Date)	Branch/Mail Code:	CPOD
	Phone Number:	513-487-2094
	FAX Number:	513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-23

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	COMBUSTION FINE PM

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/12/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 03/31/2013		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Bill Linak (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-5792	
	FAX Number:	
Project Officer Name: Diane Pierce (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2708	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Renita Tyus Renita Tyus (Signature) 4/12/12 (Date)	Branch/Mail Code: CPOD	
	Phone Number: 513-487-2094	
	FAX Number: 513-487-2109	

Scope of Work

Combustion Fine PM

This WA contains three tasks to generate, collect, and characterize particulate matter (PM) and other pollutants from stationary combustion sources burning fossil fuels (coals, fuel oils, gasoline, petro-diesel) and biofuels (wood, glycerol, ethanol, bio-diesel). Portions are being conducted in collaboration with students, post doctoral researchers, and NERL and NHEERL investigators to perform chemical characterization and exposures and collect PM for health studies. Task 1 describes collection and characterization methods. Tasks 2 and 3 describe modification, operation, support, and maintenance of three experimental facilities used to generate these samples.

The contractor shall perform the following tasks:

Task 1. Combustion Particles – Collection, Physical and Chemical Characterization

Background

Combustion particles are ubiquitous ambient air contaminants derived from a large variety of mobile and stationary sources. Exposure to combustion PM is associated with carcinogenic and immunotoxic effects in humans and experimental animals. At the cellular level, these health effects are underlain by genotoxic and inflammatory properties of chemical compounds present in the PM. Combustion PM is composed of elemental, inorganic and organic compounds that vary widely in composition with the source of the fuel, combustor/boiler/engine operating conditions, sampling methods and other parameters. The genotoxic and inflammatory potencies of combustion PM also vary with its physicochemical properties, and these differences along with multiple health effects impede the development of targeted regulatory strategies for mitigating the impact of combustion PM exposure on human health. Combustion emissions shall be generated, and PM samples shall be collected using a number of fuels, fuel additives, combustor/boiler/engine types, operating conditions, and collection techniques. These PM samples shall then be stored and characterized through extensive chemical and physical analyses. In conjunction with the chemical and physical analyses (described above), whole particles and extracts shall be provided to NHEERL investigators for subsequent determination of inflammogenic and genotoxic potencies.

Objectives / Scope of Work

The objectives of this WA task are to generate and collect a number of combustion PM samples with different physical, chemical, and toxicological properties, and (in conjunction with NHEERL investigators) and correlate differences in the PM properties with adverse health effects and mechanisms of toxicity.

Combustion PM samples shall be analyzed for size and morphology during production while detailed chemical analysis shall be performed post-collection. Physical measurements shall include particle size distributions using a scanning mobility particle sizer (SMPS) and an aerodynamic particle sizer (APS). Particle concentrations shall be assessed with gravimetric filters and TEOM instrumentation. Particle morphology shall be examined by scanning and transmission electron microscopy. Chemical analysis shall involve qualitative analysis by aerosol time of flight mass spectroscopy (ATOF-MS), quantification of elemental and organic carbon (OC/EC), inorganic trace element analysis by x-ray fluorescence (XRF) and inductively coupled plasma-mass spectroscopy (ICPS). Additional samples shall be subjected to solvent extraction with dichloromethane (DCM), and then sequential fractionation using hexane, 50% hexane/50% DCM, DCM, and methanol to determine the relative concentrations of polar and non-polar compounds. Extract mass shall be determined gravimetrically. Organic extracts shall be further analyzed using gas chromatography in conjunction with mass spectroscopy (GC-MS) in the full scan mode. Acquired spectra shall be searched against a computerized mass spectral library and shall also be reviewed manually. Standards of both PAHs and nitro-PAHs shall be analyzed and semi-quantitative values shall be obtained

by comparing area ratios of any particular peak to the internal standard. Approximately 25 peaks shall be examined and emphasis shall be placed on those peaks that appear to differ between the samples. Since many of the more polar compounds may not be detected by the GC-MS because of their volatility, high performance liquid chromatography in conjunction with Ion Trap Mass Spectroscopy (LC-MS) shall be performed. In addition to organic analysis, PM samples may be characterized by electron paramagnetic resonance (EPR) analysis for presence and concentration of stable free radical species.

Deliverables

The contractor shall deliver raw analytical data (computer files and data sheets) and reduced data in the form of Excel spreadsheets, pie charts, and graphs of the data collected for each PM sample.

Task 2. Metal Fuel Additives for Soot Reduction – Diesel Engines and Atmospheric Pressure Diffusion Flames

Background

Metal-based catalysts are added to diesel fuels with the intention of increasing fuel economy and reducing emissions. These fuel borne catalysts (FBCs) are divided into a class of liquid-phase organo-metallic materials that form nano-scale particles during the combustion process, and a class of solid-phase nano-scale metal oxides that are added to fuel and kept in suspension with surfactants. Commercially available formulations include (but are not limited to) compounds containing iron (Fe), platinum (Pt), and cerium (Ce).

While studies have shown that metal FBC additives can reduce particle mass emissions, there is also evidence that they may increase particle number emissions and otherwise affect the physical and chemical characteristics of diesel exhaust emissions and may result in increased levels of some air toxic chemicals such as benzene, 1,3-butadiene, acetaldehyde. Unless the use of metal FBCs is done in conjunction with diesel particulate filters (DPFs) their use will likely increase the ambient emissions of these metals. Research questions include to what extend do metal FBCs affect diesel related particulate and air toxics emissions (especially in the ultrafine size range <100 nm), and the potential health effects associated with the large-scale application of metal FBCs.

Objectives / Scope of Work

The objectives of this WA task are to operate and maintain two existing experimental facilities designed to examine emissions from combustion with metal FBC additives. These include a Burke-Shumann diffusion flame experiment designed to examine metal FBCs applied to sooting gaseous fuels (ethylene) and a small diesel engine gen-set with controlled dilution designed to examine metal FBCs in engines. Improvement to the existing facilities and development of new experimental capabilities are anticipated. The objectives of this research are to design and execute parametric studies to characterize the physical and chemical properties of gas and particle emissions with and without metal FBCs (Fe, Pt, and Ce). This study may also take advantage of the existing animal exposure facility, and collaboration with NHEERL investigators to perform animal exposure experiments, and collect appropriate samples for instillation studies.

Combustion PM samples shall be analyzed using techniques similar to those identified in Task 1.

Deliverables

The contractor shall deliver raw analytical data (computer files and data sheets) and reduced data in the form of Excel spreadsheets, pie charts, and graphs of the data collected for each parametric study.

Task 3. Glycerol Combustion

Background

Glycerol, glycerine, or Propane-1,2,3-triol is a compound used as a component in medical and pharmaceutical products, livestock feeds, lubricants, food additives, plastics, nitroglycerine, antifreeze, and fabrics. Glycerol is currently produced during saponification of fats (soap making) and transesterification of triglycerides (biodiesel production). While pure glycerol is a marketable commodity, the recent growth of the biodiesel industry has flooded the market with an excess supply of glycerol. This has caused a substantial continual drop in the price of glycerol.

Biodiesel is produced from the transesterification of triglycerides (most commonly from vegetable oils or animal fats) via reaction with an alcohol (typically methanol) and a catalyst to produce fatty acid methyl esters (FAME, the biodiesel molecules), and glycerol . The common base catalysts are potassium hydroxide and sodium hydroxide. Volumetrically, for every 10 units of biodiesel produced, roughly one unit of glycerol byproduct is created and must be disposed. In a large-scale biodiesel facility, this can amount to millions of gallons of crude glycerol a year. Some biodiesel operations have successfully used crude glycerol as livestock feed additives and fertilizers. Still many currently pay to have glycerol shipped away to landfills. Thus, it is important to find new value added uses (including applications as fuels) for waste glycerol. Glycerol combustion could also be a key factor in the development of new second generation biodiesel processes, which require large thermal inputs and also creates waste glycerol. Heating the reactants can significantly increase the transesterification reaction rate, and so any large biodiesel plant will typically need to use a significant amount of thermal energy. Burning glycerol for process heating would offset energy costs, eliminate transportation costs (plants could burn their own glycerol on site), and act as an effective mode of disposal. However, the difficulty of burning glycerol has prevented this from becoming a chosen solution in the biodiesel industry.

Glycerol is much more difficult to burn than conventional hydrocarbon fuels. While glycerol contains significant energy, its energy density is much less than fuel oils. One kilogram of glycerol contains roughly 16 MJ of chemical energy, in comparison to kerosene, which has 42.8 MJ/kg, or gasoline with 44.4MJ/kg. Glycerol is also a highly viscous liquid at room temperature, with a kinematic viscosity over 450 centistokes, compared with water which has a kinematic viscosity of 1 cS. Kerosene has a kinematic viscosity of 2.71 cS, and gasoline falls between 0.46 to 0.88 cS, depending on the grade. The high viscosity of glycerol makes it impossible to atomize cold pure glycerol using standard nozzles found in fuel oil burners. It should be noted that waste glycerol from biodiesel production may contain some alcohol which will lower the viscosity, but many biodiesel producers prefer to evaporate and recover the alcohol from the glycerol for reuse. Glycerol can also be heated to dramatically reduce its viscosity, with a viscosity approaching that of #2 fuel oil at 100 C. Initial small-scale experiments at NCSU have demonstrated the efficient burning of glycerol in a high-swirl burner with propane preheating and air-blast nozzles.

Objectives / Scope of Work

The objectives of this WA task are to examine issues associated with glycerol combustion in larger more realistic combustion hardware. Initial efforts with use the Rainbow furnace (200 kBTU/hr) and move to the North American boiler (2 MBTU/hr). Glycerol atomization using pressure and dual-fluid nozzles shall be investigated. Flame stability and emissions shall be examined co-firing glycerol with varying amounts of natural gas and/or No. 2 fuel oil. Emissions measurements shall include available continuous emission monitors (O2, CO, CO2, NOx, SO2, THC), particulate mass (filter and TEOM), particle size distribution (SMPS/APS), and inorganic and organic compositions. Volatile aldehydes and other oxygenated HAPs are of particular concern due to the highly oxygenated composition of the fuel. This project is in collaboration with Dr. Bill Roberts (NCSU), who will provide the modifications to the burner.

Deliverables

The contractor shall deliver raw analytical data (computer files and data sheets) and reduced data in the form of Excel spreadsheets, pie charts, and graphs of the data collected for each experimental study.

General Support

The contractor shall provide technical support, operating experience, analytical support, and expendable materials to conduct these tests using existing in-house combustion systems or through the fabrication, rental, purchase, or lending of additional combustion equipment as necessary. This support shall include:

1. The contractor shall provide expendable materials and building supplies to modify, operate, and maintain the necessary combustion equipment, dilution processing equipment, and sampling equipment as appropriate.

2. The contractor shall provide engineering and operating labor for the design and execution of test plans on these furnaces engines, and dilution systems.

3. The contractor shall maintain, calibrate, and operate monitoring equipment according to APPCD's Recommend Operating Procedures (ROPs), QAPP requirements, safety requirements, and instrument manuals.

4. The contractor shall collect and retain necessary operational data to ensure compliance with NC Air permit reporting requirements.

5. The contractor shall operate and maintain the experimental systems and air pollution control system in full compliance of NC Air permits.

Quality Assurance Project Plans (QAPPs)

The contractor shall perform the activities described in Tasks 1-3 in accordance with the QAPPs entitled:
DEP Collection - QTRAK 04033 9/4/07
Combustion Particle Analysis - QTRAK 07048 1/15/09
Generation and Delivery of DEP for Health Effects - QTRAK 98018 8/7/07
PM Emissions from a Drop Tube Furnace - QTRAK 02062 1/1/05
Glycerol Combustion – QTRAK 09053 10/5/09
The contractor shall revise or amend these QAPPs as needed in accordance with quality assurance requirements. If revisions are necessary, data acquisition shall not commence until official approval is received from EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on the "Quality Assurance Review Form" included with this extramural action.

Documentation of Technical Direction

The WAM and contractor's project manager shall schedule weekly project meeting in which task progress, issues, and future direction shall be discussed. The contractor's project manager shall summarize the notes from each of these meetings in the form of an e-mail message to the WAM. This summary shall help assure clear communication, establish project priorities, and provide documentation of written technical direction.

Reports of Work

The following reports of work shall be provided.

1. Monthly progress reports with labor costs and ODC charges.
2. Health and safety plans as required by EPA safety officer.
3. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form" included with this extramural action.
4. Update Facility Manuals as required by EPA QA officer.
5. Operate Compliance reports as required by NC Air permits.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-23

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 03/31/2013 Base Option Period Number 3	COMBUSTION FINE PM

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☐ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 04/12/2012 To 03/31/2013

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 03/31/2013	Cost/Fee: $0.00	LOE:
This Action:	$99,953.00	
Total:	$99,953.00	

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 04/20/2012	Cost/Fee: $99,953.00	LDE: 1,351
Cumulative Approved:	Cost/Fee: $99,953.00	LOE: 1,351

Work Assignment Manager Name: Bill Linak (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-5792 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-2708 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Renita Tyus Renita Tyus (Signature)	5/21/12 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2094 FAX Number: 513-487-2109